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ABSTRACT

A study compared costs and effectiveness of online learning (OL) with traditional face-to-face teaching methods. Six case studies (from New South Wales, Victoria, and South Australia) provided data on these of two types of OL: (1) mixed-mode delivery using the computer and Internet in a classroom and (2) use of OL in distance education. The Webb (1999) information technology cost model was used. OL effectiveness was assessed by student questionnaires and interviews. Satisfaction ratings for different types of online learning were compared with the ratings of all technical and further education graduates. Among the findings were: (1) regarding classroom-based, mixed-mode delivery with low interactivity and heavy reliance on content, courses were high in cost compared with traditional classroom instruction and low on effectiveness in terms of student satisfaction; (2) with high levels of interactivity using the Internet and use of pre-existing Web-based resources, costs were often lower and students rated effectiveness more highly than traditional classroom instruction; regarding distance delivery, contrast was between the traditional correspondence model with its low interactivity and heavy reliance on content and online delivery with potential for high levels of interactivity; (3) using online communication for distance learning to provide high levels of interactivity could cost about twice that of a low-interaction, print-based correspondence course, but learning effectiveness ratings were better and on a par with satisfaction levels for classroom-based courses. These three strategies were suggested to improve OL cost-effectiveness: reduce costs,

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improve learning effectiveness, and increase volume. (Contains 46 references.) (YLB)

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Online Delivery in the Vocational Education and Training Sector: Improving Cost Effectiveness [and] Case Studies.

Richard Curtin

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NCVER

Online delivery in the vocational education and training sector

Improving cost effectiveness

Online LEARNING

Richard Curtain

CE 083 348

Online delivery in the vocational education and training sector

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NCVER

Editor's note:

This report has been organised into two parts. The first part describes the scope of the study, the methodology used and the main findings and includes a literature review. The second part comprising the case studies can be found in the web edition on the NCVER website www.ncver.edu.au.

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Executive summary

Can technology improve the cost-effectiveness of vocational education and training? Is online learning able to lower costs, widen access while also lifting the quality of learning to improve the learning outcomes? For the same or lower dollar expenditure, can learning effectiveness can be increased, or more students can be taught to the same level or above for the same level of investment? (Bates 1996).

Study focus

This study compares the relative costs and effectiveness of online learning with traditional face-to-face teaching methods. It does not aim to provide a definitive answer to the question of whether online delivery is cost-effective or not. The range of different types and institutional settings in which online delivery takes place makes it impossible to offer a conclusive answer in most cases, other than it depends on how online delivery is implemented. The one exception relates to staff training for an enterprise where online delivery can involve substantial cost savings while increasing markedly numbers in training.

The case studies provide rich detail about the operating conditions under which different types of online delivery are likely to be cost-effective. In general terms, the case studies demonstrate the potential cost-effectiveness of the new interactive focus of online delivery technologies. The new emphasis on the value of interaction is in contrast to the content-heavy and often expensive delivery modes associated with earlier flexible learning approaches. The case studies demonstrate the potential of new, more flexible forms of work allocation for achieving cost-effective outcomes.

Nature of the evidence used

The study is based on six case studies of two different types of online learning. One is the mixed-mode delivery using the computer and the internet in a classroom setting. The other mode is the use of online delivery for distance education to students in remote locations. The six case studies, from three States (New South Wales, Victoria and South Australia) and a variety of institutional settings in the vocational education and training (VET) sector, offer different contexts for identifying cost-effective outcomes.

The case studies draw on information from structured questionnaires administered to course co-ordinators, teachers and students. A particular feature of the study is the measurement of learning effectiveness through the comparison of the student satisfaction ratings of different types of online learning compared with the satisfaction ratings of all technical and further education (TAFE) graduates.

Difficulties measuring costs

However, as noted by previous Australian National Training Authority (ANTA) research, assessing the relative costs of flexible learning compared with traditional face-to-face teaching is, in most cases, an extremely difficult task. In the case of large institutions, these costs cannot be easily tracked in the absence of activity-based and lifecycle accounting systems. The constraints of a limited time for each case study and the reluctance of most education and training providers to provide data they regard as confidential required the use of a simple estimation methodology. Course co-ordinators and instructors were asked to assess the cost differential for particular items compared with a traditional delivery mode. However, in one case, absolute costs are reported due to its origins as a stand-alone project.

Broad findings

Despite the limitations of the information on relative costs, a number of valuable conclusions can be drawn from the six case studies. In relation to the two types of online delivery, classroom-based, mixed-mode delivery and the distance delivery mode, two broad models of cost-effectiveness are identified. In relation to classroom-based mixed-mode delivery, where there is low interactivity and heavy reliance on content, courses tend to be high in cost compared with traditional classroom instruction and low on effectiveness in terms of student satisfaction. On the other hand, where there are high levels of interactivity using the internet and the use of pre-existing web-based resources, the costs are often lower or at least not greater than traditional classroom instruction. In the latter instances, students rate effectiveness more highly compared with conventionally taught courses.

In relation to distance delivery, the contrast is between the traditional correspondence model with its low interactivity and heavy reliance on content, and online delivery with its potential for high levels of interactivity. Evidence from one case study suggests that using online communication for distance learning to provide high levels of interactivity can cost about twice that of a low-interaction, print-based correspondence course. However, learning effectiveness ratings are better than low-interaction, traditional distance education courses and are on a par with the student satisfaction levels for classroom-based courses.

Strategies to achieve cost-effective outcomes

The case studies suggest three strategies to improve the cost-effectiveness of online delivery. One is to reduce costs (while maintaining current levels of effectiveness and volume). The second is to improve learning effectiveness (while maintaining current cost and volume levels). And the third is to increase volumes (while maintaining current levels of cost and effectiveness).

The first strategy can be applied by identifying the range of new work roles required by online delivery and assigning work on the basis of the required skills. For example, student support services for online delivery can be separated from the roles performed by instructors and offered by lower cost personnel. The case studies provide examples of how existing forms of work organisation can act as a major constraint on achieving lower costs and how, in some instances, this constraint was overcome.

In relation to improving learning effectiveness, the case studies also show that scope exists through online delivery to lift the level and quality of interaction. The case studies show a shift away from learner–content interaction. Evidence is offered of improved learning outcomes where online delivery enhances learner–instructor and learner–learner interaction. For example, one case study showed that assessment through use of an online interactive quiz greatly lifted student satisfaction ratings. Advances in computer adaptive testing where the test items change in response to the performance of the test taker offer considerable scope for improving learning effectiveness.

The third strategy of increasing the number of students while not increasing costs is illustrated by the Qantas College Online case study. Resistance from first-line instructors to releasing their staff was severely limiting the numbers available for classroom-based training. Online delivery enabled courses to be accessed by staff in a variety of locations, including at home and at times convenient to the business and to employees. The result was a major increase in the number of staff in training.

Online delivery clearly has the potential to deliver more cost-effective outcomes. Ideally, it should be possible to implement a strategy that optimally combines ways to reduce costs, improve effectiveness and, at the same time, increase student numbers. However, whether online delivery does or does not, depends on the extent of the accompanying changes in work allocation and other operating parameters. Where the institutional constraints are not addressed, the case studies suggest that online delivery is likely to remain an island of innovation in a sea of resistance.

Structure of report

This report has been organised into two parts. The first part describes the scope of the study, the methodology used and the main findings, and includes a literature review. The second part comprising the case studies can be found in the web edition on the NCVER website www.ncver.edu.au.

1 Identifying the costs and effectiveness of online learning

> *… online learning represents one of the most important developments of the past hundred years for higher education.*
> (Mayadas 2000)

> *Educationally, students require a mix of pedagogical support, guidance, and supervision, which can be provided in a myriad of ways. The US classroom is a 150 year-old, relatively low-cost technology, worn out by time and changed conditions for meeting these requirements.*
> (US Secretary of Education 2000, p.120)

> *… the economics of online courses are complex, fascinating and not transparent*
> (Bartolic-Zlomislic & Bates 1999a)

> *While there is much published literature which claims that substantial benefits may be derived from online technology in education and training, few systematic and rigorous evaluations have been published and there is, at this time, limited reporting of outcomes for instructors, learners and organisations.*
> (Harper et al. 2000, p.38)

Introduction

ANTA's *Bridge to the future* strategy for 1998 to 2003 notes that 'new forms of educational and communications technology will generate increasing demands for flexible, convenient and accessible training' with more and more Australians expected to demand 'just in time', 'just for you' vocational education and training through the internet. The aim of ANTA's National Project for New Technologies is to encourage the accelerated take-up of flexible learning modes to better 'position Australian VET as a world leader in applying new technologies to vocational education products and services' (ANTA 2000a, p.15).

The benefits of online delivery

The report of the United States Government's Web-based Education Commission in December 2000 notes three main benefits of adding online resources to higher education class presentations. First it makes readings, original sources, or specialised materials more easily accessible to students. Second, it encourages more out-of-class student reflection and interaction among students or with the instructor. And, third, it helps to meet the expectations of students who increasingly anticipate that courses will be supplemented with online materials or discussions. However, the report acknowledges that creating a course for online delivery can take much longer, with anywhere from 66% to 500% greater time resources required than creating traditional courses, with the result that costs are widely variable.

Current and future trends

A 2000 National Centre for Vocational Education and Training (NCVER) national survey reports that only 2.2% of TAFE graduates indicated that their course delivery method was solely online learning. A further 0.3% of TAFE graduates indicated that online learning was one of several modes of delivery used in their course. The picture was similar for module completers (2.3% indicated that their course delivery method was online learning and a further 0.3% said it was one of several delivery modes used). These results, however, may not reflect the use of online content within classroom teaching, as the survey did not define what online learning entailed.[1]

A good indicator of future trends in online learning in Australia is the evidence of its rapid expansion in the United States. Two-fifths (43%) of United States higher education courses now use Web resources as a course component (Web-based Education Commission 2000, pp.75–6). In 2002, 2.2 million higher education students in the United States are expected to enrol in distributed learning courses, up from 710 000 enrolments in 1998 (US Secretary of Education 2000, p.77).

The importance of cost-effective applications of online delivery

The application of new internet-based technology is not an end in itself—by seeking to keep up with the 'state of the art'. The aim of public funding new applications of the new technology is to achieve greater flexibility in the delivery of vocational education and training through online delivery. However, there are two constraints on this funding: costs and effectiveness. Growth from the cost savings of achieved efficiencies is the cornerstone of the Australian National Training Authority (ANTA) agreement governing the funding of Australia's vocational education and training system. In real terms, this means that the Commonwealth Government agrees to provide additional funding provided the States and Territories agree to achieve specified efficiencies so that funds can be redirected to achieving growth and system enhancement goals (ANTA 2000b, chapter 2, p.19).

One of the specified means for achieving these system efficiencies is: 'the use of new technology to enhance the flexible delivery of training and achieve long term saving' (ANTA 2000b, chapter 2, p.19). A key element of this strategy is the redirection of infrastructure funding away from new buildings to investments in advanced computer, multimedia and communications equipment and systems.

However, the ANTA report on directions and allocations 2001 also notes that 'the requirement to balance both efficiency and effectiveness considerations, which often involves additional costs' (ANTA 2000b, chapter 2, p.19). Several States and Territories (NSW, South Australia, Tasmania, the ACT and the Northern Territory) have highlighted, as a key strategy for delivering longer-term efficiency gains, the use of new technology to provide flexible delivery (ANTA 2000b, appendix A).

Nevertheless, comments from other States and Territories note that the benefits may not be immediately evident or indeed may not be realised at all. Queensland notes that its investment in technological infrastructure to 'position Queensland's VET system for the future may take several years to realise benefits'. Western Australia response about the efficiency gains expected from its ongoing development of flexible and online delivery initiatives is also circumspect, noting only that while it will improve the quality of delivery, it 'may provide for further efficiencies in future years'. The Northern Territory has stated that, for them, implementing national initiatives such as flexible delivery is particularly difficult because their smaller scale means they are able to achieve few economies of scale in developmental and implementation costs (ANTA 2000b, appendix A, p.85).

The challenge for governments as funders and for education and training providers is to work out the most effective ways to make use of the new technology to deliver significant cost savings, improve learning outcomes and increased student reach. The purpose of this report is to draw on empirical evidence to demonstrate the circumstances through which online learning most likely to deliver cost-effective outcomes.

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[1] The question asked was: Which of these describes the way the course was delivered? 'Online learning' was one of the options, see NCVER 2001, appendix, p.23.

Online learning and flexible learning strategies

The term 'flexible learning strategies' is one which refers to teaching methods and forms of delivery that differ in some way from 'traditional' classroom-based learning. The term was initially was used to refer to:

> *options and opportunities that enable learners to control substantial segments of the educational process—to choose how they tackle the task before them. In a world where both industry and society require individuals who are able to use their initiative, make decisions, solve problems and adapt to and manage change, the education we provide needs to encourage this development.*
>
> (*Open learning in the TAFE sector: Introduction* 1995)

Flexible delivery was seen to be characterised by a host of distinctive features based on a range of options in relation to:

- points of entry and exit
- program components
- modes of delivery
- greater learner control and choice regarding the content
- appropriate learner support systems such as better access to information on courses and services
- appropriate learning resources
- flexible assessment processes

The flexible learning strategies varied from traditional distance education or the correspondence method of delivery to open learning with its emphasis on a range of teaching methods away from the classroom. The latter often used communications technologies such as audio tapes, broadcast television, interactive multimedia and videotapes and videoconferencing as well as printed materials. The differences between traditional and flexible delivery systems in terms of delivery options and student characteristics together with their cost differences are outlined in table 1.

A 1999 official statement about flexible learning, *Framework for national collaboration in flexible learning in vocational education and training 2000–2004* (ANTA 2000a), placed a new emphasis on the use of online delivery as an important way to implement a flexible learning strategy. The role of the Education Network Australia Vocational Education and Training Advisory Group (EVAG), as stated in 1999, was to set 'priorities for flexible learning in VET, with particular reference to online technologies'. The 1999 strategy document stated that:

> *… VET must use the tools of the new economy—innovative ideas and technology embedded in its products and services—to move away from the old industrial mass-production approaches to teaching and learning, to offer convenient and customised products and services to an expanded national and international customer base. It must be capable of translating a good idea into a new training product or service that more and different customers want. It must become an admired creator of new knowledge about vocational learning and online services, as well as continuing to be a big user of information. As with other service industries such as retail, legal, medical and financial services, it must exploit to the fullest the potential of new and emerging technologies to help it transform the way it does its business.* (ANTA 2000a, p.6)

However, the *Australian flexible learning framework strategy 2001* has shifted away from the more experimental or knowledge-building phase to refocus more sharply on:

- 'learners in both enterprises and institutions—their needs and aspirations and how online approaches can better respond to them'
- communication with VET practitioners, providers and policy-makers about how flexible learning will be strengthened to maximise the national take-up of project outcomes
- rationalising the number of projects to achieve efficiencies and to capitalise on the linkages between them (ANTA 2000b, p.57)

Table 1: Differences between traditional and flexible delivery in terms of costs and student characteristics

Traditional delivery	Flexible delivery
Cost issues	
• High capital costs	• Low capital costs
• Fixed & relatively stable delivery costs	• Variable delivery costs
• Information delivered 'face-to-face' in accepted cost framework	• Information delivered via developed materials or electronic means in an undeveloped cost framework
• Shifts to flexible and 'off-site' delivery challenge the infrastructure establishment	• High initial costs, amortised over time (years)
• Territorial boundaries will become less meaningful	• The shift to flexible delivery will entail high development or product transformation investment
Student characteristics	
• Scheduled, supervised and measurable attendance	• Unscheduled relatively unsupervised study
• Peer support available easily	• Peer support not easily accessed
• Instructional resources easily available	• Institutional resources at often higher cost
• Predictable cost of attendance	• On-the-job delivery as a means of cost containment

Source: Derived from ANTA Unit Costs Working Group (1998, p.12)

This research project lies firmly within the new direction of the *Australian flexible learning framework strategy 2001* with its emphasis on identification of how online learning approaches can better respond to the needs of learners in both enterprises and institutions in terms of cost-efficiencies and effective learning outcomes. The case studies, with their mix of delivery modes, offer valuable insights into the changing nature of both costs and effectiveness. The case studies provide rich detail about the new interactive online technologies compared with the earlier, content-heavy and often expensive communication technologies associated with flexible learning.

2 Literature review of cost-effectiveness studies

> *In higher education, there are several models for addressing productivity gains through information technology. The implementation of IT can lower costs, especially on the business support side. IT can theoretically lower costs on the academic side, but great care has to be taken not to lower quality. There has been too little investigation of how academic use of technology can lower costs and retain or increase quality.* (Kobulnicky 1999)

Defining online learning

Online learning can be broadly defined as the use of the internet in some way to enhance the interaction between teacher and student. Online delivery covers both asynchronous forms of interaction such as assessment tools and the provision of web-based course materials and synchronous interaction through email, newsgroups and conferencing tools, such as chat groups. It includes both classroom-based instruction and as well as distance education modes. Other terms synonymous with online learning are 'web-based education' and 'e-learning'.

> *E-learning is considered the latest advance in technology-based learning. It is generally regarded as 'electronic' delivery of learning on the Web, or Internet-enabled learning. E-learning is seen as an alternative to taking courses in the traditional classroom setting, providing flexibility and convenience in education … The model that is emerging is access to learning, where, how and when it is needed, in a learning environment that exists almost entirely on the Web.* (Charp 2001, p.1)

Flexible learning strategies involving the use of the internet have generated much interest in academia and industry. However, as Whalen and Wright (1999) note, cost–benefit analyses of web-based distance learning are sparse. Research on not only costs but also how these relate to effective outcomes is also rare. On the basis of a search of key sources, only 15 articles or books could be identified that discuss or report results of a study of the cost-effectiveness of flexible learning studies. Only two of these relate to an Australian context.

Identifying costs of online learning

A review of the literature on cost–benefit analysis of education delivery modes reveals that analytical frameworks for identifying costs and effectiveness are still in the early stages of development. In particular, the review shows that no consensus has yet emerged on what are the key components of a cost estimation model.

Government initiatives

The issue of the relative costs of flexible delivery has been explored by government reports in the USA, UK and Australia. The United States Government's Web-based Education Commission has recently released its report: *The power of the internet for learning: Moving from promise to practice* (US Secretary of Education 2000). The Web-based Education Commission recommended the use of a 'total cost of ownership' model to work out the costs of the new technology (see box 1). This approach breaks down into component parts each of the expenses involved in using technology to enable them to be more clearly analysed. However, the model mainly relates to the costs of purchasing and maintaining the technology only and does not address recurrent costs, particularly of developing and delivering content via the new technology.

Box 1: The total cost of ownership model for new technology

Elements of the 'total cost of ownership' model include:

- Hardware (purchase price, warranty, annual maintenance, depreciation or life cycle, and upgrades)
- Software (license price, support, and upgrades)
- Networking (hardware, software, warranties, maintenance, depreciation, and upgrades)
- Internal staffing (salaries overhead for management, operations, help desk/user support and applications development)
- Other costs (consultants/contractors, installation, training and downtime

All of these capital and operational costs (including staff salaries) are totalled and divided by the average life cycle (years until replacement) and divided again by the number of PCs. This yields an average annual cost per computer.

Source: International Data Corporation (1997)

The UK Further Education Funding Council, in its guidance statement on funding for the year 2000–01, has announced that it is commissioning a comparative cost study to identify the relative costs of distributed, open and distance learning, particularly online delivery and via new technology (FEFC 2000, p.7). The aim of the study is to develop a methodology for future funding as well as to identify the monitoring and audit requirements for distance and online learning.

Academic studies

Models for estimating costs in relation to flexible learning have been developed by Bates (1995) and Rumble (1997). Bates (1995) proposes a two-stage model focussing on production and delivery. Rumble (1997) suggests a four-stage process for estimating costs:

- production costs (including development/conception)
- transmission
- distribution costs (including copying of materials)
- reception costs (including teaching costs and costs incurred by the student)

Rumble (1997) also distinguishes between capital costs and recurrent costs. The former refers to costs for the purchase of equipment or materials. Recurrent costs are the costs that occur on an ongoing basis such as, for example, the cost of computer support. Production costs are those associated with the development of a course/program, while delivery costs are costs associated with the delivery or development of 'teaching' course materials.

Bates (1995, p.38), in costing educational technologies, emphasises the importance of distinguishing between fixed and variable costs. Fixed costs do not change with output, while variable costs do. Distinguishing between fixed and variable costs, he argues, is essential in determining the numbers of students necessary to justify the use of a particular technology.

In terms of production and delivery costs, Bates notes that the use of education technologies also involves a differing ratio of production to delivery costs compared with conventional education where there is little difference between the costs of production and the costs of presentation. Another important dimension to estimating the costs of online delivery is the difference between the cost of the equipment (hardware) and the cost of the content and how it is delivered (software, courseware).

Moonen (1997) has proposed a five-stage model for estimating the costs of online delivery: development, production, delivery, operation and maintenance. In relation to costs, Moonen (1997) pinpoints the following cost items in relation to personnel; equipment; facilities; materials and other costs, calculated in a 'costs per activity phase' breakdown of a development phase, and a delivery, operation and maintenance phase. However, it has been noted that Moonen considers neither the costs associated with students, in terms of their income or expenditure, nor those of staff, except as employees of the institution (Ash & Bacsich 2000).

Bates (1995, pp.42–3) identifies five types of cost measures—each with a different purpose and stakeholder perspective on its value (see table 2). According to Bates, the measure that provides the best comparison between costs of different technologies is the cost per student study hour (the average cost per hour of study contact in relation to a particular technology or delivery mode for every student taking the course). This is because it takes account of both volume of activity and number of students.

Table 2: Types of cost measures in relation to online learning

Cost measure	Of interest to
• Total costs over the whole life of a course or project for different numbers of learners taking that course	• Education provider deciding whether or not to fund new education technology, and those working within a fixed overall budget.
• The marginal cost of increasing the volume of teaching by one unit	• Manager of a service who wishes to maximise investment in production resources by reducing unit costs.
• The marginal cost of adding an additional student to a course	• Education provider that wishes to recover delivery costs through student fees.
• The average cost per hour of study material for a particular technology	• Education providers able to vary significantly the volume of teaching.
• The average cost per student study hour.	• Education providers wanting to compare the costs of different technologies

Source: adapted from Bates (nd)

However, while cost per student contact hour is a common measure used in the VET sector in Australia, it is a system measure used for allocating funds. The determination of the cost per student contact for a particular mode of delivery requires the use of an institution-wide, activity-based accounting system to enable the costs of different activities associated with a particular form of delivery to be distinguished. As will be noted below, such systems are difficult to establish due to the amount of detail required and the regular flow of input required. The complexity of the range of activities to be tracked for costing purposes is shown by the three-stage 'course lifecycle' model of Ash and Bacsich (1999, 2000) described below.

Ash and Bacsich, based on an extensive literature review, have sought to establish a universal but realistic costings framework as the first step towards identifying the cost-effectiveness of each course offered. Building on the frameworks developed by Bates (1995), Rumble (1997), Moonen (1997), Stahmer (1995) and Hunt and Clarke (1997), they have proposed a comprehensive three-stage 'course lifecycle' model as the basis for estimating costs:

- planning and development
- production and delivery
- maintenance and evaluation (Ash & Bacsich 1999)

A feature of their model is that it not only includes the stages of the pre-existing models but also includes evaluation as a key step in the process of establishing an innovative training program (see table 3).

Ash and Bacsich note the importance of 'hidden' or unrecorded costs (such as academic staff overtime or printing costs incurred by students) and those costs that are absorbed into larger budgets (and therefore not attributed to individual activity) (see table 4). It is these hidden or unrecorded costs that can only be uncovered by a sophisticated activity-based accounting system. This requires staff to track costs closely in terms of time and other resources using various methods. These can include the use of workload planning systems; program managers estimating staff time spent on each activity; teachers estimating the proportion of time they spend on each activity; or conducting a diary or timesheet exercise, as a one-off or ongoing project.

There have been attempts in Australia to use such methods to estimate the costs of flexible learning methods. However, as noted below, these studies have shown how difficult a task it is. The studies also have not focussed on the specifics of online learning.

Table 3: A lifecycle costing model for networked learning

Planning and development	• Collecting materials
	• Coming up with, or being told, the idea
	• Writing the business plan
	• Purchasing and evaluating existing materials or developing your own
Production and delivery	• Curriculum delivery
	• Progress monitoring
	• Marking and feedback
Maintenance and Evaluation	• Quality assurance exercises
	• Replacement and updating of materials
	• Evaluation against course aims outlined in business plan

Source: Ash and Bacsich (1999)

Table 4: Cost components of the Ash and Bacsich lifecycle costing model of networked learning

Expenditure dimension	**Stakeholder dimension**			**Total**
	Institution	Student	Staff	
Staff costs	Salaries, wages, pensions etc.	Opportunity cost of learning not earning	Opportunity cost of not doing a better job	
Depreciation	Buildings, computing provision	Own home computer and accessories	Own home computer and accessories	
Expenses	Subsistence, registration	Computer consumables, connection charges	Expenses incurred on business travel	
Overhead	Software licences	Additional insurance	Additional energy requirements	
Total				

Source: Ash and Bacsich (1999)

Australian studies

The ANTA Unit Costs Working Group has collected data from twelve TAFE institutes in five States on the resource utilisation patterns of flexible delivery options. The working group's first report, *Flexible delivery: Resource allocation models (stage 1)* (ANTA 1997), noted that flexible learning offers two broad sets of opportunities to achieve cost-efficiencies. The first is the potential for the more flexible deployment of resources by reducing idle capacity and lessening dependence on a minimum number of students for a particular course. The second is the opportunity to achieve economies of scale by increasing the number of students in a course, thereby reducing the unit costs of delivery.

The findings from stage 1 of the ANTA project noted that the 'the costs of the underlying delivery activities and component services making up flexible learning are not well understood'. It was noted that activity-based analyses are required to work out the resources used; outputs and costs are required to calculate how to improve the use of resources. However, the report noted that the case study institutions did not have available data in a form that could be used to identify the costs of particular activities and outputs.

The second report of the ANTA Unit Costs Working Group presents information on the costs profiles of different flexible delivery patterns. Table 5 outlines the activities and physical outputs identified as the key components of a resource allocation model for flexible learning. The courses surveyed are based on distance learning with occasional workshops/residential and on-the-job assessment and field placement exercises but not with online delivery. Other forms of flexible learning covered in the ANTA case studies are: continuous enrolment, self-paced learning, individual learning support, recognition of prior learning, and student choice of study options.

Table 5: Activities and physical outputs identified as the key components of a resource allocation model for flexible learning

Activity	Physical outputs
Develop learning materials	Curriculum design
	Design & production of learning packages
	Development of new products
	Online delivery development
Market product	General or specific publicity advertising
Enrol students	Career counselling
	Student selection processes
	Student enrolment
Deliver product	Student orientation
	Course delivery
	Preparing & delivering workshops
	Student pastoral care
	Assessment, recognition of prior learning, credit transfer
Support delivery	Program administration
	Work team meetings
	Staff development
Provide learning support to students	Learning resources issued to students
	Provide access to library research facilities
	Computer access
Provide other student support	Student counselling other than subject-related
	Employment services
	Broad career counselling
Process results	Maintain student assessment records
	Issue results sheets and parchments
Provide admin/management support	Compile with system requirements re OHS, access & equity, quality systems
	Corporate admin
Provide IT infrastructure	Maintain wide area networks
	PC support
	Systems admin
Provide facilities	Provide for operating costs of facilities used
	Contribute to cost of general facilities

Source: ANTA (1998)

However, the main thrust of the ANTA working group report is an examination of the difficulties the researchers noted in recording costs because of the absence of institution-wide, activity-based accounting systems. The ANTA working group noted that the cost profiles were difficult to compile because the institution's existing accounting, financial and student management information systems did not allow for activity and output-based costing. As noted above, activity-based costing requires staff to complete timesheets and to include time spent outside normal working hours. In particular, all cost elements could not be matched neatly to specific activities, especially communications and consumables, with, in many cases, only estimates possible, based on extrapolations of averaged data (ANTA 1998, p.55).

Moonen (1997) has also highlighted the difficulties of collecting cost data in relation to innovative learning systems. He has identified four reasons for this: disagreement about which costs should be taken into account, unavailability of reliable data due to lack of systematic collection procedures, and the instability of recorded costs due to their evolving nature. The fourth and not the least, is the perception by providers that cost data are confidential and, therefore, not to be made publicly available.

Defining the effectiveness of online learning

> *If technology is used as an add-on to existing activities, rather than as a means to reshape education, then it will simply add to the total cost of operations and few savings will be realised. Business has learned that productivity gains and cost savings come only when old ways of doing business are abandoned and technological solutions replace them.*
>
> (US Secretary of Education 2000, p.120)

In broad terms, effectiveness is concerned with outcomes: training is effective to the extent that it produces outputs relevant to the needs and demands of its clients. It is cost-effective if its outcomes are relevant to the needs and demands of clients and costs less than the outputs of other institutions that meet this criterion (Rumble 1988).

The report of the Web-based Education Commission, a bipartisan committee of the United States Congress, notes that the costs of the new technology need to be offset by a growth in educational productivity. However, the report acknowledges that this requires other organisational changes to be made to achieve more productive educational environments. The report also notes this process of supporting organisational change may not be a rapid one as 'the productivity gains found in [United States] business through investments in technology took three decades to emerge' (US Secretary of Education 2000, p.120).

The defining features of effective learning, presented in table 6, are derived from the discussion in the United States Web-based Education Commission's report of education research findings on enhanced learning performance (US Secretary of Education 2000, pp.5–9). In terms of the learning process, the Web-based Education Commission identified four key elements from research: type of knowledge, learner focus, nature of social interactions, and forms of assessment. Table 6 highlights the differences between traditional teaching methods and the conditions for promoting effective learning. The table also suggests that online delivery, where it uses its interactive potential, is well-positioned to achieve many of these features of a more effective learning environment. These include deeper levels of knowledge acquisition, more responsiveness to learner needs, opportunities for closer collaboration between peers and more thorough assessment of higher-order skills.

Moore (1993) suggests that effective learning in the content of distance education requires maximizing three forms of communication:

- learner–content interaction
- learner–instructor interaction
- learner–learner interaction

In relation to interaction between learners and content, Smith, Ferguson and Caris (2001) point out that, online delivery, due to its reliance on text-based communication and a lack of visual cues, requires that each aspect of a course has to be laid out in meticulous detail to avoid misunderstandings. This means, for example, that directions for every assignment must be spelled out in a logical, self-contained way.

> *… Web-based distance classes require considerably more work, often including hundreds of hours of up-front work to set up the course. On the other hand, the development of an online class, especially one that began as a face-to-face course, makes the instructor confront and analyse the material in new and different ways.* (Smith, Ferguson & Caris 2001, p.3)

Table 6: Key elements of traditional teaching and enhanced learning approaches

Focus	Traditional teaching methods	More effective learning environment
Type of knowledge	Focus on the short-term recall of facts	Creation of opportunities for deeper building of knowledge
Learner focus	Organised around the top-down, teacher- and- textbook centred instruction	Focussed on the needs of the individual learner
Nature of social interactions	Social interaction limited to occasional times with peers in the classroom with the emphasis on solo study	Social interaction encouraged with an emphasis on collaboration between peers
Assessment	Assessment methods focussed on content knowledge	Assessment geared to testing higher-order cognitive, affective, and social skills
Use of technology and online delivery	Mimics top-down, lecture or text-driven model of instruction.	Explores interactive potential

Source: US Secretary of Education 2000, pp.58–9

However, this preparation and the mode of interaction can also help greatly in delivering more effective learning outcomes. Smith, Ferguson and Caris (2001) note that the emphasis on the written word in threaded online discussions encourages a deeper level of thinking in online classes because students must write their thoughts down, and expose them to others in the class.

Threaded online discussion can also encourage wider participation because students who are usually shy in the face-to-face classroom are more likely to participate in the online classroom. Smith, Ferguson and Caris (2001) summarise their findings about the learner content and learner instructor interaction of web-based online college courses as follows:

> *They are a labour-intensive, highly text-based, intellectually challenging forum which elicits deeper thinking on the part of the students and which presents, for better or worse, more equality between instructor and student. Initial feelings of anonymity notwithstanding, over the course of the semester, one-to-one relationships may be emphasized more in online classes than in more traditional face-to-face settings.* (Smith, Ferguson & Caris 2001, p.3)

In relation to learner instructor interaction, Williams and Peters (1997) note that the role of the instructor needs to change from that of content provider to content facilitator by becoming proficient in using the web as the primary teacher–student link. This involves learning to teach effectively without the visual control provided by direct eye contact.

What are cost-effective outcomes?

> *E-learning requires significant investments of time and money, both to develop courses and for revision of courses. Potential for large-scale usage has been over-sold, and return on investment is over-stressed. Whether it shall result in better learning and higher efficiency still needs to be proven.* (Charp 2001, p.2)

Rumble, in *The costs and economics of open and distance learning* defines a cost-efficient system as 'relative to another system, its outputs cost less per unit of input' (Rumble 1997, p.120). Cost-effectiveness in relation to open and distance learning is defined as being a situation where '… its outputs are relevant to the needs and demands of clients and cost less than the outputs of other institutions that meet these criteria' (Rumble 1997, p.161).

Rumble (1997, pp.161–5) outlines four ways in which cost-effectiveness can be measured. The first is by measuring effectiveness against an absolute standard. Effectiveness is defined as the ratio of the actual outcome to the possible or ideal outcome. An ideal outcome is one, for example, where all students pass the course. The second way of measuring effectiveness is through a measurement of relative effectiveness. The pass rates of two similar courses but differing in their use of online learning are compared with each other. The pass rate of one course is divided by the pass rate of the other to give a relative effectiveness ratio.

Looking at the quality of the student's performance is the third way of measuring effectiveness. This is done by examining how much learning occurs during the course by testing students at the beginning and end of the course and comparing results. The final way of measuring effectiveness is through a weighted average across a range of variables. Using this method, an overall effectiveness ratio can be calculated across different variables, such as subject matter knowledge, theoretical skills, practical skills and attitudes.

Recent studies of corporate in-house training suggests that online delivery in this environment produces results whereby costs are lower and learning outcomes better (Chute, Thompson & Hancock 1999, pp.16–20; Schreiber & Berge 1998, pp.282–3). However, key components in these lower-cost results are savings in travelling costs and student downtime. Within the corporate training situation, the company incurs these costs that affect the bottom line costs. By contrast, in a VET situation, the institution/provider does not bear the costs of students' travelling or time costs. While the students implicitly face such costs, these are often not recorded as a cost in assessments of the cost–benefits of flexible learning.

The literature on costs and learning outcomes in the education sector is less clear-cut, and there is controversy over the results (see Chapman 2000, pp.307–57). However, the research tends to suggest that online learning in the education sector produces results whereby learning outcomes are better or at least on a par with current systems (although there are some caveats on this), but costs are generally higher to produce this result (Navarro & Shoemaker 1999; Carey 2001; Kashy et al. 2001).

There is not, of course, one cost/learning outcome relationship for current pedagogical techniques—there is a range of relationships, depending on factors such as teacher skill, student motivation, and access to resources. Such variables will affect the cost/learning outcome relationship for online learning as well. There are likely to be subjects in which online education is more cost-effective. There are also going to be techniques and approaches that will assist or improve the effectiveness of online education. The case-study approach adopted for this study is particularly suited to illustrating some of these complexities.

We define cost-effective online delivery as a course or module which has the same or better outcomes as a traditional distance education or face-to-face course for the same economic outlay. Outcomes are defined as course completion rates, the academic achievement of students such as course pass rates, and the satisfaction with the course by staff and students.

3 Methodology

The purpose of this chapter is to outline the specific research questions underpinning the study, and to demonstrate how the six case studies, representing nine courses or modules with online components, were selected. Also described are the major data-gathering methods used and how the conditions of access to some of the case studies required some variation in these methods. The chapter also notes the strengths and the limitations of the methodology employed.

Research questions

The major research question is how does online delivery compare with traditional face-to-face teaching in terms of its costs and its effectiveness. Other related questions addressed in the study are:

- What organisational changes have been made to accompany online delivery?
- What have been the costs of the organisational changes accompanying online delivery compared with traditional face-to-face delivery methods?
- How effective is online learning from the perspective of the major stakeholders involved?
- What changes are planned to increase the cost-effectiveness of online delivery?

A focus on organisational supports

The focus of the case studies, therefore, is broader than a mere focus on the rudimentaries of costs and outcomes. The issues of the organisational obstacles impeding the realisation of the benefits of online learning and organisational supports required are considered at length in each of the case studies.

ANTA's strategy statement *Flexible learning for the information economy* (ANTA 2000a) notes that applying new technologies to vocational education and training involves a complex change-management process. The statement identifies five reasons that help explain the disappointing results often produced by change projects: failure to approach change in a holistic manner, lack of an adequate skills base to carry the changes through, lack of ownership by those responsible for managing and implementing change, inflexibility in planning or management and lack of support for the change over the longer term (ANTA 2000a, p.14).

An important aspect of achieving effective learning outcomes, therefore, is the establishment of appropriate processes and systems, involving new work practices backed by structures, roles and policies and people with the necessary skills to carry out the new work roles. An important focus of the case studies, therefore, is the type of organisational change necessary to deliver effective learning outcomes.

Model for estimating costs

The literature review in chapter 2 noted that any accurate costing of different delivery methods requires the use of activity-based accounting systems or detailed diary-keeping. It is important that a systematic method for tracking costs applies not just to a course or department but also across a whole institution. However, it was also noted that in the absence of these ways to record systematically costs over time, it was impossible to disentangle the costs of the normal delivery from those associated with a new technology.

The alternative to identifying actual component costs is to estimate the relative differences in the cost of delivery. Based on this approach Webb (1999) has developed a model to estimate the costs of online delivery in relation to a specific vocational education and training course (See Webb 1999; Webb & Cilesio 1998, 1999a, 1999b). The Webb model uses the estimates of experienced staff to work out the relative difference in costs of online delivery compared with the traditional delivery mode of distance learning.

Webb's 'IT cost' model comprises three parts: set-up costs, annual investment costs and recurrent costs (see table 7). The set-up costs refer to the front-end costs—such as equipment purchase, classroom accommodation, staff training and learning material development. Recurrent costs refer to the costs required to run a program once everything is set up. Webb uses the category 'annual investment costs' to capture the cost of those activities that are needed each year but, in a TAFE institute setting, they are often subject to funds being available. Institutional overheads are not incorporated into the model as the focus is on estimating the incremental or marginal cost of doing a course by a particular delivery method.

Table 7: IT cost model for online delivery in the VET sector in Australia

Establishment costs	
Equipment purchase price & installation	Accommodation
Staff training (current staff)	Learning material development
Annual investment costs	
Revision of learning materials	New learning materials
Enhancements to equipment	Equipment replacement cost
Recurrent costs	
Orientation	Learning material to media
Delivery cost	Learner support
Workshops	Assessment marking
Subject management	Course management
Equipment management	Staff training (new teachers)
Equipment support and maintenance	Service support and maintenance
Equipment operation	Teacher technical support
Communications costs, Insurance, security, postage & telephone	

Source: Webb (1999)

In each of the case studies, except Qantas College Online, a course co-ordinator was asked to estimate recurrent costs of online delivery as a proportion of the traditional budgeted costs (percentage more or less) during a specified time period. However, in one case study, ACE Online, actual costs could be identified due to its non-institutional setting and project-based funding. In another case study, Regency Hotel School Adelaide, information on estimated actual costs of online mixed-mode delivery compared with classroom delivery is presented using a model of inputs and a simple set of assumptions.

The Webb IT cost model was used as the basis for data collection in the case studies because it is based on costs identified in relation to the Australian VET sector, and it covered both online and traditional distance education.[2] Its methodology of using instructors to estimate the differences in costs for various components was also attractive, given the time and funding constraints on this study. These did not make it possible to initiate an extended period of primary data collection on a range of activities.

Measuring effectiveness

The effectiveness of online delivery is assessed in the case studies in several ways. The constraints of access, the availability of course-related information on completion rates and student availability meant that no one method for assessing learning effectiveness could be used. In four case studies a questionnaire was administered to students to seek their assessment of the learning effectiveness of online delivery and their satisfaction ratings of aspects of the training process. In other instances, the module completion rates of courses with online delivery components were also available for comparison with completion rates for traditionally delivered courses.

Effectiveness of online learning student questionnaire

An instrument to assess student learning effectiveness was developed by a leading researcher, Professor A Bates, for a series of studies he had undertaken into the cost-effectiveness of flexible learning. The Bartolic-Zlomislic & Bates (1999b) study of the costs and benefits of using six different software products used in online learning, entitled *Assessing the costs and benefits of telelearning*, incorporated a 'course student learner effectiveness' questionnaire, which was made available on the web.[3]

This questionnaire was used, with modification, as the basis for the 'effectiveness of online learning student questionnaire' to survey students. The questionnaire covers the topics of the use of technology and the delivery method, perceived skills development, interaction between student and instructor and with other students, perceived problems and benefits of online delivery. The format of the questionnaire was designed as a web page and students were invited to complete the questionnaire through an email message.

An important additional feature of the survey instrument used in this study is the inclusion of a series of items to gauge student satisfaction in relation to learning effectiveness from the 2000 NCVER student outcomes survey (see table 8). The national survey covers students who successfully completed their TAFE course or module during 1999 and left the system. The inclusion of these items makes it possible to make authoritative comparisons between the satisfaction ratings of students who have experienced online delivery with TAFE graduates in general. As noted in chapter 1, few courses are delivered online in TAFE, so the large sample of TAFE students surveyed (n = 41 600) offers a robust reference point for comparing student satisfaction ratings of the effectiveness of online delivery with traditional delivery methods.

However, the effectiveness of online learning student questionnaire survey could only be administered in four of the case studies. In the case of Qantas College Online, a learner evaluation had recently been carried out in-house and this was used as the basis for assessing learner effectiveness. In the case of Regency Hotel School Adelaide, the online course had finished and students were no longer online. In addition, it was also judged to be an extremely busy time for the students and therefore unreasonable to expect them to fill in a mailed questionnaire as they were all working full-time in the hospitality industry. However, in several case studies, students in several courses were surveyed, offering an expanded scope for comparing outcomes. These case studies were: ACE. online, Adult Multicultural Education Services (AMES), and the Box Hill Institute of TAFE. As noted in the introduction to this chapter, some nine courses or modules with online components are covered by the cases studies.

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[2] In relation to the enterprise case study, the additional category of staff salaries and staff travel was also added.

[3] http://research.cstudies.ubc.ca/newsurvey.html [accessed: 7 June 2001]

Table 8: Student satisfaction rating on different aspects of learning

Aspects of learning rated

- Instructor's knowledge of subject content
- The balance between instruction and practice
- Making methods of assessment clear
- The subject content reflects industry practice
- The presentation of training material
- The quality of the equipment provided for you to practise your skills
- Having enough equipment for you to practise your skills
- Access to learning resources
- The convenience of both venue and class times
- The usefulness of the training for your job prospects
- The overall quality of the training you have received

Measuring effectiveness on the basis of outcomes

Administrative records in relation to three case studies can also be used to identify outcome differences between the different delivery modes. The administrative information relates to the working or work rate (proportion of students submitting work assignments within a module) and the module completion rate within a course. This information is available in several instances before and after the introduction of the online delivery components.

The case study of the Anatomy and Physiology course at Box Hill Institute of TAFE offers an effectiveness outcome measure that is based on a comparison of the module completion rates pre-online and online delivery. The case study of the Certificate Level 4 in Information Technology (PC Support) delivered by the NSW TAFE's Distance Education Institute offers three types of output and outcome measures: the working rates for the course for the years 1998 and 1999, and information on the module completion and course completion rates for the years 1997 to 2000. The case study of the new online degree course at the Regency Hotel School, Adelaide reports on both the work rate and the module completion rate.

Other information collected

The case studies are also based on information gained from the use of questionnaires and face-to-face interviews with course co-ordinators and senior managers. Information for the case studies also included relevant background, such as other assessments of the effectiveness of online delivery.

Case studies: Basis for selection

The six case studies were chosen to reflect the institutional differences in how online learning is delivered. The nominated selection criteria for the case studies were:

- a range of providers in terms of size and type of provider (TAFE, private and enterprise-based)
- case studies from several states and regional locations
- inclusion of established institutions to assess how they are developing cost-effective ways of using online learning

- inclusion of online delivery arrangements linked to a large-scale distributive system such as TAFE Virtual Campus in Victoria
- at least one case study of an ACE (adult and community education) provider
- coverage of non-IT courses to gauge the learning effectiveness of online delivery for students who not necessarily strong in IT

In terms of the first criteria, providers selected ranged from a small project-based service provider operating in the adult and community education sector, to a medium-sized specialist provider of training in English as a second language, a large metropolitan TAFE institute, a TAFE traditional distance education provider, a joint venture between a TAFE institute and an overseas education institution and an enterprise-based distance education provider, Qantas College Online.

The case studies are located in three States (NSW, Victoria and South Australia). They involve students located in regional areas as well as in metropolitan locations. The distance education component of the Anatomy and Physiology course at Box Hill services students in a number of rural areas in Victoria. Information Technology (PC Support) delivered by NSW TAFE's Distance Education Institute services students in a variety of geographical locations. The ACE.online course for teachers in the adult and community education sector operates across regional Victoria as well as in Melbourne. Qantas employees in overseas offices were also served by Qantas College Online courses. The AMES Victoria's Virtual Learning Centre had subscribers in New Zealand, Vietnam and Japan.

The backgrounds of students varied from those with basic literacy and computer skills, to students with a strong interest in computers and students taking degree-level courses. The employment status and motivation of the students also varied from job seekers seeking additional skills, to full-time students seeking occupational skills and employees wanting to improve their career options within a large enterprise.

The type of VET course also varied from general or remedial education (for example, English as a second language) to those with a specific vocational focus (for example, the modules Anatomy and Physiology I and 2 form part of the Certificate IV Animal Technology and the Certificate IV Applied Sciences (Biological Sciences) or the Diploma of Applied Sciences (Biological Sciences). Other vocational courses included in the case studies are the Bachelor Degree in International Hotel Management, the Information Technology (PC Support) Certificate IV and courses directly related to the needs of a large enterprise. The courses range from certificate II to diploma level and degree levels as well as professional development for teachers.

The case studies encompass two different types of online learning (see table 9). One is face-to-face delivery (F2F) in a classroom setting in an on-campus location combined with online delivery using the computer and the internet. The other is distance or 'arm's length' use of online delivery to students in a remote location. The case studies do not follow a simple demarcation by focussing on one or the other mode. In three case studies, both delivery modes are represented.

The case studies selected, therefore, highlight the wide variety of practices that online learning encompasses. They show that the implementation of online learning differs greatly by the type of institutional setting in which it is delivered, how the work is organised and allocated, the prior education and IT competency background of the students served and the uses made of the available technology. In particular, the case studies demonstrate how much organisational context shapes the extent to which cost-effective outcomes can be achieved.

Table 9: Case studies of online learning: institution name and location, type of education provider, type of delivery mode, and student location

	Education provider					
	ACE NET Werribee ACE.online Victoria	AMES, Springvale Melbourne	OTEN DE-NSW	Box Hill Institute of TAFE, Melbourne	Qantas College Online, Sydney	Regency Hotel School, Adelaide
Type of provider	Adult & community education	TAFE	TAFE	TAFE	Private provider	Private joint venture with TAFE institute
F2F& Online with on campus location	ESL (English as Second Language) Environment course	AMES Certificate of Spoken & Written English		Anatomy and Physiology 1 & 2		Degree course, International Hotel Management
Online delivery with remote location	ACE.online teachers' course		OTEN IT (PC Support) course certificate IV course	Anatomy and Physiology 1 & 2	Courses related to broad range of skills	Degree course, International Hotel Management

Strengths and weaknessess of the case study method

The particular strength of the case-study method for studying organisations is the way it enables the researcher to describe the whole in an integrated way. The case-study method offers the greater potential for complex processes to be described and more easily understood than does other forms of research. This method is also well suited to tracing the connection between a range of factors and thereby has an increased chance of identifying cause-and-effect factors.

However, to achieve its potential, the case-study method requires collection of information from different levels in the organisation. The method also requires the ability to be able to confirm information or interpretations from more than one source within an organisation.

Given that members of an organisation have different perspectives on goals, policies and practices, it is essential to ensure that a variety of views are sought to facilitate a complete overview of the organisation's activities. This process is known as triangulation: cross-referencing information from different broad levels of responsibility (senior manager, departmental heads, teachers and students).

In addition, for this research project, the case studies include more robust representative data. These include the survey responses from a number of students relating to their perceptions of learning effectiveness as well as administrative data on module and course work and completion rates.

However, a particular weakness of the case-study method is the limited capacity to use the findings to generalise to other organisations or settings. One way to address this weakness is to carry out a number of case studies of organisations with similar characteristics. In this instance however, the relatively new and evolving nature of online delivery justifies the selection of a more diverse range of case studies to provide the basis for an exploratory study.

A more rigorous methodology designed to identify actual cost differences or differences in learning outcomes between online and conventional teaching is not only highly resource-intensive. Particularly in the latter case, it also requires a research design that in some way controls for extraneous variables to be able to demonstrate cause and effect. This involves controlling for differences among students, for example, in terms of their motivation and IT capacity as well as the nature of the online delivery and the interest and capacity of the instructor. This level of rigor in research design is required to offer more definitive results about the cost-effectiveness of online learning.

Conclusion

The range of situations encompassed by the case studies in relation to the types of online delivery, types of providers, types of courses, as well as student profiles suggest that any conclusions drawn about the cost-effectiveness of online learning can only be suggestive of broader trends. As noted above, the breadth of contexts covered in the case studies reflects the diversity of ways in which online delivery is being implemented. Readers interested in locating their own online arrangements in relation to the case studies will be able to be able to do so. The main findings of the case studies, the subject of the following chapter, are reported with specific attention to the mode of type of online learning (at a distance or in a classroom), how it is delivered (more or less interactive) and the type of students (highly motivated or less engaged). Reported this way, the findings offer readers with a specific context for online learning in mind a valuable insight into how to achieve more cost-effective outcomes.

4 Main findings

The purpose of this chapter is to provide an overview of the case studies in terms of the forms of online delivery surveyed, and the broad findings in relation to cost and effectiveness. The bulk of the chapter summarises each case study, with a brief introduction, and outline of main findings in relation to the relative costs of online delivery, its learning effectiveness compared with more traditional teaching methods and the key issues in the context of the wider organisational setting and ways to improve outcomes in the future.

Importance of location and level of interactivity

The best way to situate the case-study findings in relation to cost and effectiveness is to consider each course or module in terms of two dimensions: location and interactivity. Both these dimensions have a major impact on relative costs and learning effectiveness and therefore need to be taken into account in reporting the findings.

The first aspect refers to a training delivery spectrum ranging from classroom-based instruction at one end, to distance education at the other. Online learning in a classroom setting involves face-to-face contact with the teacher, but nevertheless using the computer and the internet to varying degrees to aid the learning process. This is known as mixed mode of delivery in the case studies. Online learning delivered as distance education involves the use of the internet, in part or solely, to deliver the course to students located off campus. This is referred to as the distance learning mode in the case studies.

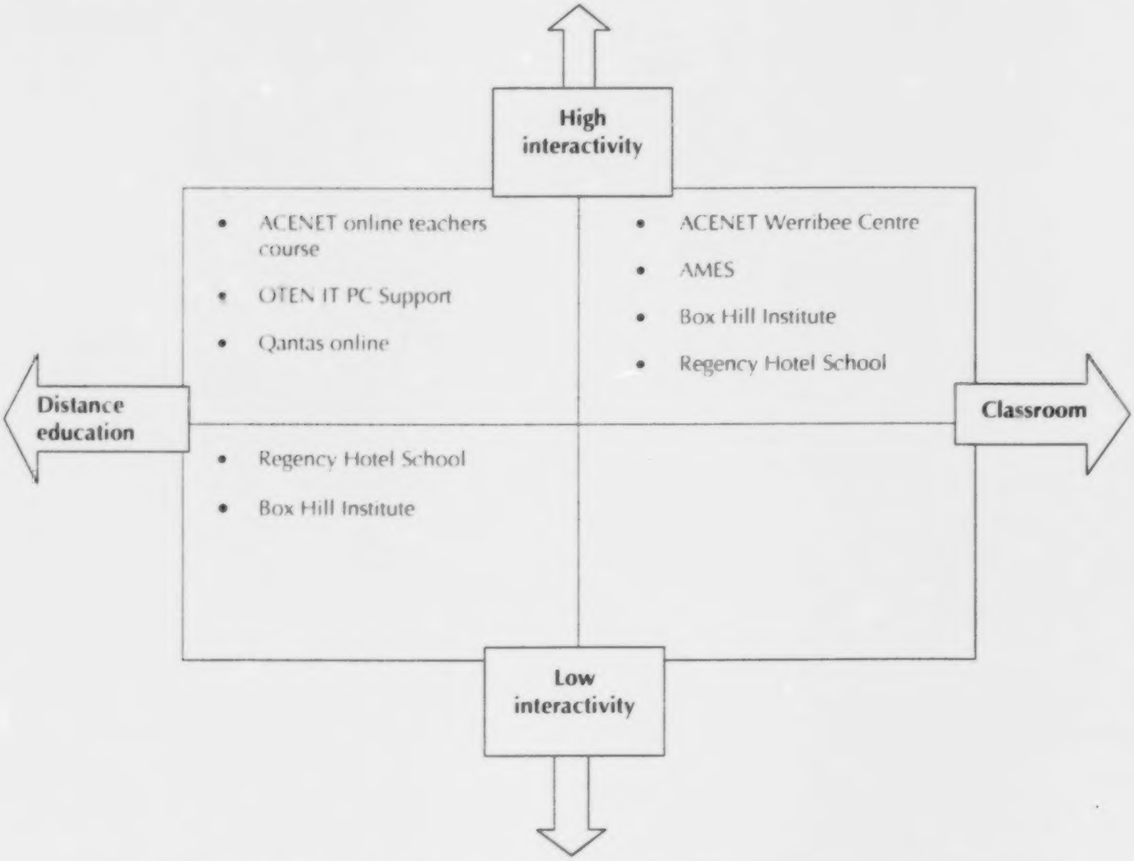
The level of interactivity is the other dimension that affects both the costs and the effectiveness of online learning. Low levels of online interaction have been termed the self-study or 'broadcast' model where self-study materials, ranging from simple text to quite sophisticated multimedia, are posted on the web, and these are studied by learners at their own pace. This model can also be viewed as a form of online publishing (Mayadas 2000, p.1). The self-study or broadcast model underpins distance education in its traditional correspondence form and, to varying degrees, in its online forms. However, as several of the case studies demonstrate, the level of interactivity also varies as mixed-mode delivery formats.

A high level of interactivity refers to engaging students in one-to-one and one-to-many exchanges. The focus is on 'any time, any place' or asynchronous learning. Courses at this end of spectrum use the internet primarily as a communications facilitator to foster exchanges between instructor and students, and among the students themselves. Its secondary role is as a medium for distribution of learning materials (Mayadas 2000, pp.1–2).

The different types of online learning described in each of the case studies are shown in the diagram in relation to the two dimensions of location and interactivity (see figure 1). A number of students undertaking the Anatomy and Physiology modules at Box Hill Institute of TAFE and International Hotel Management from the Regency Hotel School were doing so from remote locations and the level of online interactivity was judged to be low. Others employing a distance learning mode with varying levels of interactivity from low to high were: Qantas College Online courses, the Open Training and Education Network (OTEN) IT PC Support and the ACENET online teachers course.

Classroom-based online delivery was used for the ACE English as a Second Language (ESL) Environment module at ACENET Werribee Centre, the modules in the Certificate for Spoken and Written English, run by AMES Victoria and for the on-campus students in the Box Hill Institute's Anatomy and Physiology modules and the Bachelor Degree in International Hotel Management at the Regency Hotel School. The levels of interactivity were judged to vary from low in the latter instances to high in the former.

Figure 1: Location of case studies on two dimensions: distance from the classroom and interactivity



The following discussion of each case study summarises the main findings of each of the case studies.

Qantas College Online: Distance learning in a corporate setting

Background

Qantas Airways, with its 30 000 staff across a network spanning 124 destinations in Australia, the Americas, North and South East Asia, UK/Europe, and the Pacific is an obvious candidate for online delivery. Qantas College Online started in 1995 with three courses, which by 2001 had expanded to some 65 courses, offered online. These range from customer and business focus, training skills, language and literacy, cultural awareness, to a range of aviation-oriented technical skills. All courses are self-paced and most are tutor-supported.

Each course is designed to be undertaken in 20 to 30 minute sessions. Most course study guides are based on the learner spending one hour per week online.

Approximately 7000 Qantas staff members have registered their interest in taking a course with Qantas College Online. This represents a 23% uptake rate in relation to the total workforce of almost 30 000. In 2001, 3795 staff have enrolled or are participating in courses.

The reasons behind Qantas's decision to make a substantial investment in distance learning help to explain the different operating context for enterprise-based training compared rather than using the services of an independent vocational education and training provider. Organisational constraints were impeding staff take-up of training opportunities. Supervisor resistance to releasing staff from their normal rosters was identified as a key barrier to training access. The attraction of providing global access for its geographically dispersed staff was also another important factor. Thirdly, the value to the enterprise of easily customising training content was also important. Fourth, there was a strong interest in helping business units to align training with individual and business performance goals.

These factors help to explain the greater level of upfront investment that large enterprises in particular are likely to make and the across-the-organisation focus for the use of online learning.

Relative costs

The Qantas College Online case study shows that distance-based online delivery can produce a much less costly training option for enterprises because it removes the need to cover travel and accommodation costs associated with undertaking training in a central location. However, the more important cost saving is the gain in productive time, as most staff who are online learners (78%) now complete their online course in their own time. However, the new locational flexibility of online delivery comes at some additional cost to both the individual employee and to the enterprise. For employees working from home, there is the establishment cost of a computer (or an upgrade required to access the internet), the recurrent costs of internet access, the printing of materials as well as the cost of the individual's own time. Within the enterprise, there is the additional cost of ensuring that employees who wish to learn at work have access to a dedicated computer. There is also the recurrent cost in some locations of a co-ordinator to introduce staff to online delivery. The recurrent costs for the enterprise of online delivery relate to the use of external tutors and the maintenance of technical equipment.

The additional cost to the individual employee in terms of time and home-based expenses is offset by the greater access to promotional opportunities on the basis of new skills acquired. This increased access to training comes from the greater ease with which approval is given to undertake a training course as it has much less impact on a business unit's bottom line.

Thus online delivery makes it is easier for individuals to make their own decisions about undertaking further learning related to work and their career prospects within a large enterprise. As many of those undertaking an online course are doing to so to improve their career options within Qantas, this cost-sharing between the individual and the enterprise appears reasonable.

Learning effectiveness

The case study also highlights the importance of the effectiveness side of the equation. Just under one-third (32%) of online course-takers were completing their course. This completion rate had increased from about a fifth (21%) a year earlier due to improved registration and enrolment processes, the introduction of study guides for all online courses and improved access to computers at work. The marked improvement in the completion rate in response to process changes suggests that online learners are highly sensitive to the support offered.

Key lessons

This suggests that enterprises adopting online delivery need to go through several steps to determine a reasonable balance between keeping costs low while looking at ways to increase learning effectiveness. The cost-effectiveness of online delivery in a corporate setting is not a simple matter of applying new technology. Regular evaluation of the impact is also needed.

Enterprises are more likely than other training providers to view online learning as a cost-effective form of training for several reasons. First, online delivery minimises the loss of productive time by bringing the training product to the employee and not the other way around. Second, costs can be distributed more equally between employer and employee, reflecting the economic benefits that training confers on both parties. Third, online learning makes it much easier to deliver a customised training product tailored to the needs of the enterprise. For these reasons, enterprises are much more likely to undertake the upfront investment.

Cost-effectiveness of distance learning: Online versus traditional paper-based delivery

Background

The Certificate Level IV in Information Technology (PC Support) has been delivered by the NSW TAFE's Distance Education Institute (OTEN DE) entirely online in distance learning mode for four years. The aim of the course is to provide the skills to operate a computer help desk function in a medium-to-large organisation.

The focus of this case study is on the application of online technologies within a traditional distance education framework. This means that the point of comparison is the classic correspondence-school model of paper-based post-delivered instruction.

Relative costs

In terms of assessing costs, the case study draws on the published detailed assessments of costs carried out by the course convenors (see Webb 1999; Webb & Cilesio 1999a, 1999b; Webb & Gibson 2000). The thoroughness of this work, gained from first-hand knowledge of running the course over four years, makes this information particularly valuable.

The Certificate Level IV in Information Technology (PC Support) is the only course conducted by OTEN DE that differs both in terms of costs and outcomes. The course was initially more expensive to set up than other distance education modes and is more expensive to deliver on a recurrent basis (about twice the cost of a traditional distance education course). However, counterbalancing this is a higher completion rate, which is on a par with courses delivered face-to-face.

Learning effectiveness

In terms of effectiveness, both instructors and students generally offer positive feedback. The instructors enjoy the challenges and variety, while students value the additional flexibility it provides. The case study reveals the difficulty of achieving these outcomes in a cost-effective manner, given particular factors applying in the OTEN-DE operating environment.

Webb and Gibson (2000) note that the working rate (work submitted) is considerably higher than courses utilising traditional distance education delivery modes. They also note that the module and course completion rates for the course to 1999 have improved markedly over time to a point where they are have reached the rates achieved the 'lower end' of face-to-face delivery courses and superior to those of traditional distance education delivery modes.

However, the case study notes considerably lower module and course completion rates for 2000. At the same time, a decrease in the level of interactivity compared with previous years was noted. Staff shortages in 2000 forced a reduction in the level of contact between instructors and students by comparison with previous years. Moreover, instructors were no longer associated with specific modules. In addition, there was a decrease in assistance from the help desk and newsletters are no longer issued. This lower level of interaction appears to have had a marked effect on these outcomes measures.

The case study also presents comparative data on student satisfaction levels that highlight the differences in perceived learning effectiveness between online distance education and face-to-face instruction. The analysis suggests that online distance education has a strong appeal to motivated individuals who have time constraints. However, it also suggests that levels of learning effectiveness can be improved if students are able to participate in a more responsive and interactive form of distance delivery.

Key lessons

This case study offers ample demonstration of how the cost-effectiveness of online delivery depends on a supportive wider institutional setting. Resource constraints due to the application of an institute-wide funding formula limit the funding available for online delivery. The current funding formula for OTEN makes no distinction between online delivery and traditional distance delivery. Face-to-face TAFE institutes are funded at twice the rate of OTEN if they choose to deliver the course online. The result is an emphasis on cost efficiency rather than cost-effectiveness.

The funding formula needs to take into account learning effectiveness. In other words, if online is more expensive to deliver compared with more traditional distance education courses, this extra cost needs to be judged against differences in outcomes. Better outcomes such as higher completion rates or higher levels of student satisfaction compared with the traditional distance education need to be reflected in the funding formula.

The case study illustrates another important institutional constraint—the lack of integration between systems—impeding the achievement of more cost-effective outcomes for online delivery, in common with other case studies. The existing software platform does not have open-ended interface with these systems, resulting in instructors being required to undertake time-consuming administrative tasks. Integrated software would enable the achievement of major efficiencies for both administrative staff and instructors to be achieved in the processing of applications and assessments. These staff would then be able to focus on their core responsibilities.

A third institutional or system-wide constraint noted in the case study is the absence of industrial arrangements that reflect the realities of the online environment. More flexible ways of allocating work would enable the full potential flexibility of the delivery method to be realised. There is currently no framework to determine how instructors can be paid to teach online courses. Further cost-efficiencies could be secured through the greater involvement of non-teaching staff in performing certain roles such as monitoring emails and website maintenance. At present, there is no industrial classification in the NSW TAFE award for a teacher's assistant or technical support person.

Distance learning: Professional development via online delivery in the ACE sector

Background

ACENET is a newly created, loose network of small, low-cost adult and community education training providers who have come together to use online delivery to enhance the attractiveness of their courses. ACENET, according to an independent evaluation, has over its short life, been successful in establishing effective network partnerships, implementing strong network management and making innovative and effective use of technology.

The Online.ACE teachers' course, which is entirely online except for assessment, is designed to introduce ACE teachers to online delivery and to 'become constructive and critical users of online technology'. The course was advertised as requiring one hour online, starting at 10pm on a Thursday evening. However, in practice, at least two hours of preparation as well as the time online were required per week.

The course places a strong emphasis on the use of a high level of interaction to generate active learner involvement. Emphasising increased interactivity online, however, comes at a price. The challenge is work out ways to achieve a better balance between costs of inputs and maintaining effective learning outcomes.

Relative costs

Detailed information on costs in absolute terms is available for this case study because of the project-based nature of the funding used to establish the network. The availability of data relating to costs makes it possible to distinguish between fixed and variable costs in deriving a cost per student estimate. The project-based nature of the funding used to set up the network makes it possible to identify the 'hidden' costs that may not be made explicit in an established educational institution. These 'hidden' costs include the recurrent costs of training educators, payments to internet service providers, the additional cost of technical support, as well as the set-up costs of converting existing material to an online format.

A comparison of project costs for a course developed for and delivered entirely online and a course delivered face-to-face suggests that the former is just over double the cost. The additional costs are incurred for online delivery by the pre-course training of additional support tutors and having two project officers and four supporting tutors involved in the delivery of the course rather than using only one instructor in a traditional delivery setting within no supporting personnel.

However, once the courses are 'bedded down', it should be possible to reduce costs in several ways. One way is to improve the work processes so less time needs to be spent by in providing one-to-one responses to queries. This could involve separating the help desk function from the role of 'e-moderator' and allocating it to a service provider with lower costs. It could also be achieved by making it easier for students to answer subject-specific questions by referring to a listing of commonly asked questions.

Once procedures are in place to ensure consistently effective outcomes, it should also be possible to increase the number of students to obtain a better return on the fixed costs of the resources deployed.

Learning effectiveness

Students from both the 1999 and 2000 Online.ACE teachers' course were asked to offer their assessment of the effectiveness and flexibility of the course. A high response rate was achieved (26 out of 27 course participants).

In response to the question: 'How valuable were the online or non face-to-face means of contact in helping you to learn?' as many as 92% rated online delivery as valuable, with 42% rating it as very valuable. Participants were asked to rate on a five-point scale 'which aspect [of the course delivery] was most valuable for you in helping you to learn'. Participating in chat groups received the highest rating with 89% saying that they valued this aspect of the course, and 58% rating the course highly in this regard.

The course participants were also asked to rate aspects of their training using items from the NCVER student outcomes survey. Respondents were asked to rate the nominated aspects of training using a ten-point scale.

For four out of the six training aspects compared, the online.ACE course scored better than the average ratings given by 1999 TAFE graduates. The aspects of training where the Online.ACE course scored higher ratings were: 'instructor's knowledge of subject content', 'the usefulness of the training for your job prospects' and 'the convenience of both venue and class times'. The aspects where the rating the ACE course was slightly lower than the national average were 'the presentation of training material' and 'the balance between instruction and practice'.

A rating by the teacher participants of the overall quality of the training was on a par with the rating given by a national sample of TAFE graduates. However, the equivalent reference point should be a distance education course delivered traditionally. As it is known that the latter score low levels of student satisfaction, the achievement of a comparable rating to classroom-based instruction is significant. It indicates that the online course has overcome the disadvantage traditionally experienced by arm's length instruction to achieve a similar rating to face-to-face teaching.

Despite being delivered to a potentially more critical consumer, the satisfaction ratings suggest that the online course acquits itself well as an effective means of imparting new skills to busy, experienced teachers. The level of support available and the high degree of interactivity in the course help to explain the high satisfaction ratings given by a critical group of consumers.

Key lessons

The case study demonstrates that online learning achieves its high level of effectiveness by being student-centred. This is achieved by more active learner involvement compared with the 'chalk-and-talk' mode of delivery, quick response times to queries, a better focus on individual needs and a more intellectually engaging form of presentation. These elements of increased interactivity, however, have come at a price. The challenge is work out ways to achieve a better balance between costs of inputs and maintaining effective learning outcomes.

Distance learning with low levels of online interaction

Background

The case studies cover two courses where both delivery modes—distance and classroom-based—operate alongside each other. These are the Anatomy and Physiology modules at Box Hill Institute of TAFE and the Bachelor Degree of International Hotel Management at Regency Hotel School.

Box Hill Institute of TAFE has been delivering the modules Anatomy and Physiology I and 2 since 1996. Both modules form part of the Certificate IV Animal Technology and Certificate IV Applied Sciences (Biological Sciences), which is often studied within the Diploma of Applied Sciences (Biological Sciences).

The International College of Hotel Management is a joint project of the Swiss Hotel Association, Le Cordon Bleu, Regency Institute, the Government of South Australia and a private enterprise. Of the 17 students enrolled in semester II subjects for the Bachelor Degree in International Hotel Management in 2000, eight are distance education students engaged in online delivery only.

Relative costs

Information in relation to the Anatomy and Physiology modules delivered externally suggests that this delivery mode offers much higher cost-efficiencies compared with online delivery in the classroom. The costs of computer hardware and software for the provider are minimal because they are borne largely by the student. Similarly, the costs of printing the workbooks are deflected to the student. As more reliance on email becomes the norm, the cost for telephone, fax and postage required for the distance mode will also continue to decline.

In relation to the Bachelor Degree of International Hotel Management, which is also delivered both face-to-face and online, the upfront costs were significant. The course commands a high fee and so considerable effort has been made to provide high-quality materials.

However, as a result of the upfront work, future significant cost savings will come from ease of revision compared with a traditional paper-based course. The costs and time involved in designing, editing, printing and modifying paper-based resources were found to be three to four times greater than for developing online courses. The greater ease in developing new courses for an online environment makes it more cost-efficient to provide a greater range of courses to students. By contrast, paper-based delivery is expensive to modify and is also less reliable in terms of ensuring that students are made aware of any changes. Online delivery ensures that students have access to the most up-to-date information about the course and access to reference material the instant it is posted online.

The Regency Hotel School, like all other institutional providers, does not specifically identify the recurrent costs incurred in delivery of online course. However, the TAFE SA OnLine Education Services unit has estimated recurrent online delivery costs to be marginally less than the traditional face-to-face methodology. These figures are based on assumptions that the length of the course is 20 hours, minimum class size is 15 students and the period of time over which the course is taught is 6 weeks. Comparatively, the total costs for online mode of delivery is $2020 and on-campus mode is $2356. Table 10 outlines the basis for the estimation of two delivery modes.

Learning effectiveness

The low number of external students—six—in the Anatomy and Physiology modules did not constitute a sufficient base to seek information on learning effectiveness

In relation to the learning effectiveness of the Regency Hotel School course, the work rate (proportion of students submitting work assignments) and the module completion rates offer useful measures. Some 90% of students enrolled for online delivery have submitted at least one piece of work, and 85% of students completed the module in total. This rate is marginally less than the work and module completion rates for the face-to-face delivery mode in the same course, which is 95% and over 90% respectively. The fact that students are paying full fees for each subject is doubtless a key factor in explaining such a high completion rate on online delivery.

Key lessons

Regency Hotel School initially allocated $15 000 per subject to develop and implement the bachelor degree course. The costs included teacher and management time to research and compile content material to be written for delivery, outsourcing of instructional design and conducting a trial run with staff on the delivery of the course.

Initially, online delivery was seen by the teaching design team to be largely in terms of being a methodology to reach a wide range of students. Included in this was the belief that good online delivery was dependent on the provision of high levels of multimedia presentation. However, over time, the team moved to a new appreciation that successful online delivery is largely dependent on good basic instructional materials and quality facilitation by the teacher. It is likely that if the team were to write the same nine modules for online delivery now the format and costs would be considerably reduced to approximately $10 000 per module.

Mixed-mode delivery with high levels of interaction: ESL Environment module at ACENET Werribee Centre

Background

The Werribee Community Centre, in an outer suburb of Melbourne, offers a range of courses covering adult literacy and migrant English classes and a variety of user-pays courses. The centre employs five ESL and literacy teachers, an adult education co-ordinator, and a community services co-ordinator as well as general administration support. It costs the students $10 to participate in the course and they receive a certificate at the end of the course.

The ESL Environment unit is tailored to meet the needs of students with intermediate English language skills. Several of the eleven students enrolled in 2000 had never used computers before and all had no previous experience with the internet or email. The ESL Environment course in 2000 involved two classes per week each of three hours duration. Its delivery method was face-to-face but in a computer lab with most of the work being conducted via the internet.

The course relies on extensive interaction with web-based learning tasks, and required students to engage in considerable independent learning. The students spend their class time logged onto TAFE Victoria's virtual campus (TAFE VC) which provides them with a series of seven different topics related to the environment. Other forms of communication also include posting reflections about topics on a web board, answering multiple-choice questions or completing short answer questions.

Relative costs

The project-based costings make it possible to identify estimated costs. These data suggest that an online mixed-mode course is likely to be 200% more expensive than a traditionally delivered course. The significant additional cost is the payment to the instructor of $250 per student to cover the time involved (five extra hours per student) in the intensive nature of online work, performing a help desk function and the extra time required for preparation and follow-up. For 15 students, this amounts to two hours contact per student in addition to the usual two hours per week lecture-style presentation. This is in addition to five hours per week costed for the instructor to present the course (two hours presentation and three hours preparation).

In terms of development costs, a considerable amount of instructor time was required to convert existing courses to an online format, as the learning materials for the course are required to be accessible for all users within ACENET. This development work required an upfront investment of time compared with traditional teaching methods where the teacher can prepare learning materials immediately before each class. Extra time was also needed to prepare material for general distribution as the online ESL courses are posted on the internet for anyone to access. However, time was saved later, because, once the learning tasks are put together and posted on the web, there is little further work required during class time.

One significant recurrent cost saving from online learning is access to online resources for small community centres such as Werribee as the amount of photocopying is cut down drastically. Photocopying is a major expense to the centre because ACE students are not expected to purchase textbooks. While there are still printing costs involved when the students print out their work from the internet, this also can be reduced as more students develop the practice of saving learning activities directly onto a disk and working straight from this disk.

Learning effectiveness

Two indicators of effectiveness are discussed in the case study: completion rates and student satisfaction ratings based on the responses of students to a questionnaire. Staff regard the completion rates for the ESL Environment course compared with courses using traditional methods as remarkably high. An overall indicator used by NCVER is graduate satisfaction with the quality of their course. In 1999, 67% of TAFE graduates nationally rated their course in terms of overall quality of the training received as 8 or above (defined by NCVER as satisfied). All ESL Environment students (100%) rated the overall training quality of their course as 8 or above. Eighty per cent of the students gave the overall quality of training the highest score of 10 or excellent.

Key lessons

There are several ways costs could be reduced. The first is to reduce the time required by the use of expensive resources such as the instructor. One way to do this is to allocate the help desk function to a lower-cost resource person. The second is to reduce the time that instructors spend on answering individual queries related to the subject matter of the course. This could involve developing a listing of frequently asked questions backed by an instructor using a relational database to provide quicker answers to previously asked questions. Thus, improvements to the instructor's work process are likely to reduce costs significantly.

Mixed-mode delivery with high levels of interaction: Certificate for Spoken and Written English, run by AMES Victoria

Background

The evidence presented above relating to the effectiveness of a mixed-delivery-mode course design for students of English as a second language is confirmed by the AMES case study. AMES in Victoria has been funded by government since 1951 to provide English language training for migrants from language backgrounds other than English. The services AMES now offers range from helping individuals to access nationally accredited language and TAFE training programs, obtaining recognition for overseas qualifications, career planning and assistance with entering employment

Relative costs

The AMES case study also shows course-level cost-efficiencies can be achieved if there is an organisational capacity to identify the new skills required to develop and deliver online learning and re-allocate resources to new work roles. A key lesson of the AMES case study is that new technology alone does not produce cost-effective outcomes. This depends on the organisation making a careful assessment of the new skills required and an organisational climate that encourages the adoption of new work roles.

The AMES approach to achieving cost-effective outcomes for online delivery has been to separate the key functions required, define specific work roles within these functions and to encourage incumbents to develop specific skills related to these new work roles. AMES has identified three key functions at the individual course level associated with online delivery. These are: developer, deliverer, and technical back-up. Two other key functions at the organisational level are a web-based central repository of interactive learning tasks (the Virtual Individual Learning Centre [VILC]) and the IT function to manage a reliable network.

New work roles can also be identified within each of these work functions. Within the developer function at course level, key work roles are materials writer or updater, materials and web page presenter. Within the delivery function, two work roles are identified: the more traditional face-to-face teaching role and a support one designed to provide 'customer support' for students while they are engaged in direct online learning exercises. The third key function at course level is technical back-up. This requires tailored support for the software needed to provide, for example, interactive chat groups. This can require considerable time engaged in problem-solving, such as the ironing-out compatibility problems and associated issues.

The delineation of these functions as separate work roles has resulted in several cost-effective outcomes. One is the release of the original online course developer from her face-to-face teaching duties to enable her to concentrate on revising and updating the course. This has enabled the course to be delivered in another centre. The original course developer has also been seconded on a part-time basis as a key resource person to the VILC where her skills can be better utilised there. The course presenter's role as a face-to-face teacher engaged teaching an online learning course has been divided into two functions: the upfront teaching function and a support function. An experienced teacher acts as a facilitator for four of the eight hours spent in the computer room engaged in online exercises. For the remaining four hours allocated to online work, a teacher's aide, an AMES graduate with computer skills, provides support with the online learning tasks. This arrangement enables the online course to benefit from a 30% lower wage bill for the four hours a week covered by the teacher's aide.

Another change, resulting from the development of online learning tasks, is the capacity for students to undertake their three hours of independent study time on the computers in the library without the need for a teacher to be present. Thus the wage costs in relation to these three hours for supervision of independent study have been saved through the use of online learning. This 100% wage savings for three hours together with the 30% lower wage cost of the teacher's aide for four hours have been estimated by centre management to result in an overall 20% lower wage cost for the online course compared with those that have resulted of the traditional delivery mode.

Learning effectiveness

Using the key outcome indicator of student satisfaction, as many as 83% of Certificate in Spoken and Written English IV (CSWE) graduates and current students from the online delivery course rated the overall training quality of their course as eight or above out of ten. Nearly half of the CSWE respondents (46%) awarded it the highest score of ten or excellent. This compares with 67% of TAFE graduates in 1999 nationally who rated their course in terms of overall quality of the training at eight or above.

Key lessons

AMES recognised that the skills of the initial internal innovator were extremely difficult to transfer to others. The innovator has been able to combine the new skills of how to formulate and deliver new learning tasks through online delivery with the knowledge gained from face-to-face instruction of what works and what does not. However, it is recognised that this combination of skills from two different learning contexts is rare. The ability to apply new-order skills to one's ingrained ways of working is difficult for most people. Where it is possible, it often requires the innovator to have a number of supporting resources that come together, often in a serendipitous way. From an organisational perspective, this pattern of innovation is not likely to be created by simply providing standardised training.

The case study suggests that the pattern of innovation diffusion has to be different from the process which initially developed the new forms of learning. The process of innovation diffusion requires:

- identifying the key skill sets or roles required by the new learning mode
- a redesign of work roles to facilitate the easy and cost-effective implementation of the new learning strategies throughout the organisation

- identifying the skills most difficult to replace or reproduce and those which are relatively easy to transfer
- establishing a special position to retain and further foster the skills most difficult to reproduce
- identifying and defining the new work roles involving the more easily transferable skills
- selecting people for those work roles whose acquired skills match those required.

However, in relation to this final point, this is also likely to involve providing opportunities for the new work role incumbents to learn on-the-job through mentoring with the initial innovator.

Mixed-mode delivery with low levels of interaction: Anatomy and Physiology modules, Box Hill Institute of TAFE

Background

The on-campus students in the Anatomy and Physiology modules at Box Hill Institute of TAFE spend about 50% of their time on a computer. The remaining time is spent in tutorials, practicals and other classroom activities. Students work at their own pace, reading the material and completing the self-assessment tests. The instructor is there to assist with issues arising from the subject or with technology issues.

A distinctive feature of the use of online delivery for Anatomy and Physiology modules is the use of a highly effective interactive device of the self-assessment form or quiz. In fact, the course content can be said to be built around the quizzes. Students, for example, work through the quiz prior to reading any of the content material as a way of finding out what they did not know, and then using this information to guide their study. The student response has been highly positive.

Relative costs

The case study of the mixed-mode Anatomy and Physiology modules highlights several cost-efficiencies from the use of online delivery in the classroom. The provision of self-paced learning materials frees the teacher from preparation and some classroom instruction, and the electronic quizzes and tests substantially reduces the teacher assessment load. These are the sources of significant time–cost savings.

Learning effectiveness

Data on module completion rates before and after the introduction of online delivery for internal students show a marked improvement in completion rates, in one module from 59 to 94% and from 79 to 87% in another. In relation to student satisfaction ratings, the most significant difference in favour of Anatomy and Physiology courses compared with the national satisfaction ratings concerns the assessment methods. This higher rating for assessment reflects the extensive use of the self-assessment tools as part of the online delivery arrangements. These results highlight the effectiveness of online delivery modules using a highly assessment-driven teaching model.

Mixed-mode delivery with low levels of interaction: The Bachelor Degree in International Hotel Management at the Regency Hotel School

Background

The International College of Hotel Management is a joint project of the Swiss Hotel Association, Le Cordon Bleu, Regency Institute, the Government of South Australia and a private enterprise. Of the 17 students enrolled in semester II subjects for the Bachelor Degree in International Hotel Management in 2000, nine participated in face-to-face delivery with an online component.

Relative costs

One feature of the online delivery of the Bachelor Degree in International Hotel Management, which has had a significant impact on costs, is the change from an expensive content-based course format to one based significantly more on interaction. The initial approach was based on the assumption that good online delivery required the provision of high levels of multimedia presentation. However, with experience, this view changed to a realisation that successful online delivery depends more on good basic instructional materials and quality facilitation by the teacher. As a result, the costs of module development have fallen from about $15 000 to about $10 000.

A future significant cost saving identified in relation to online delivery is that less time is required for the design and development of a course than for a traditional paper-based course. The costs and time involved in designing, editing, printing and modifying paper-based resources have been found to be three to four times greater than for developing online courses. The greater ease in developing new courses for an online environment makes it more cost-efficient to provide a greater range of courses to students.

The increased flexibility provided by online delivery means that this mode of delivery is more time-efficient and hence cost-efficient. Paper-based delivery is expensive to modify and is also less reliable in terms of ensuring that students are made aware of any changes. Online delivery ensures that students have access to the most up-to-date information about the course and access to reference material immediately it is posted online.

Learning effectiveness

As noted above in relation to the external online delivery course, 90% of students enrolled for online delivery submitted at least one piece of work, and 85% of students completed the module in total. This rate is marginally less than the work and module completion rates for the face-to-face delivery mode in the same course, which is 95% and over 90% respectively. The fact that students are paying full fees for each subject is obviously a factor in explaining a high completion rate in online delivery.

The overall effectiveness of offering a course entirely online delivery needs to be judged over the long-term as it appears to be a valuable means for motivated students to keep learning under conditions that are most convenient for them. This case study has demonstrated that a highly flexible model of learning, although initially expensive to set up, can command high fees if it is delivering vocational skills that are well-remunerated and in demand, and if it suits students' working and family commitments.

Key lessons

The change from expensive upfront content to more emphasis on online interaction also involves a new role for the instructor, changing from a 'sage on the stage' to a 'guide from the side'. The new skill set required is called e-moderation. This new role encourages the instructor to shift from initiating and directing the communications flow to encouraging the group to communicate with each other. In this approach, the role of the online moderator is to respond to the theme of the discussion rather than to respond to students individually.

This approach shifts the role of an instructor from being a teacher in a command and control mode to a facilitator from the side and reinforces the principles of self-directed learning for students. This new approach is aptly summed up well by the Education Manager of the Flexible Delivery Unit at the Regency Hotel School:

> *The main shift is changing from being a teacher to being a manager of learning. This is a big change for most people because we all have a mental model for how to learn. The new approach is based on encouraging teachers to prepare material that is self-directed and will prompt students to learn rather than be taught. The role of a teacher is to manage the learning process. This is quite a change in approach for some teachers and will be the biggest challenge in professional development for the successful management of online delivery.*

5 Cost-effective strategies

> *Our work has indicated that what is happening is a profound shift in what is meant by 'education and training', how it is delivered, and its desired outcomes. We believe that Flexible Delivery and, as a major component, Online Learning, is undergoing such growth that it requires a shift at all levels of management, process and operations to fully understand and appreciate its significance. This shift will not occur consistently or quickly, but it is evident that these changes will need to occur across four major elements of the VET process: clients, providers, teaching strategies and support materials, and the organisational structure of the VET system itself.*
>
> (Stewart-Rattray, Moran & Schueler 2001)

This final chapter summarises the cross-case study findings and outlines three strategies for improving cost-effectiveness. As emphasised in the previous chapter, the case studies offer information on online learning in a variety of contexts in terms of the nature of the online learning process deployed, type of education provider, the profile of the students served and the type of vocational education and training courses. These variations need to be taken into account in reaching some conclusions about the cost-effectiveness of online delivery.

Of their nature, the case studies are exploratory and descriptive of broad trends. For reasons noted above, the constraints on data collection did not make it possible to collect the detailed information on costs. Another factor likely to render cost data in the recent past out of date for estimating current costs is the experimental nature of the initial development of online learning. As the case study of the development of online delivery at the International Hotel School showed, the initial focus was on the expensive activity of front-end content development. However, over two years, this focus changed with recognition of the greater importance of building interaction (involving less upfront costs) into the online delivery process.

Cost-effectiveness ratings

The diversity of types of online delivery and the organisational settings in which they operate has been noted. However, it is worth offering a simple guide to the broad findings of the case studies in relation to twin issues of cost and effectiveness. As noted in chapter 1, different combinations of cost and learning outcomes are possible compared with the current mode of training delivery. The optimal outcome is one where the costs are lower and the learning effectiveness is better than those of the delivery system it is being compared with. A situation where one or the other side of the equation performs worse than those of the current system is one that requires closer scrutiny to determine whether the benefits outweigh the costs. The worst-case scenario is where the costs of online delivery are more than those of the current delivery system and the learning effectiveness does not come up to the level achieved by the traditional teaching methods.

Table 10 presents broad assessments of the cost-effectiveness of each course or module studied, differentiated by mode of online delivery (distance or classroom-based). These ratings suggest that only two courses emerge as meeting both criteria of lower costs compared with current delivery system—lower costs and more effective learning outcomes. These are the classroom-based, online delivery mode for the AMES Certificate of Written and

Spoken English modules and the Anatomy and Physiology modules at Box Hill Institute of TAFE. However, in other cases, better outcomes are recorded on one side of the equation. This applies to the lower costs only noted for the distance-based online delivery of the Qantas College Online courses. Better learning outcomes only are also noted for three of the distance learning-based courses/modules: OTEN IT (PC Support) course, ACE Online teachers course, and distance education-based students in the Anatomy and Physiology modules, and the International Hotel Management degree course. A better learning outcome only is also recorded for the class room-based ACE ESL Environment course. One course rates as on a par with the current delivery system both in terms of costs and learning effectiveness. No course or module achieves a rating worse than the current system on both counts.

Table 10: Broad assessments of relative cost-effectiveness by course/module and type of online delivery

Course/module	**Compared with current delivery system**	
	Cost	Effectiveness
Distance learning		
Qantas College Online	Less	Worse
OTEN IT (PC Support)	More	Better
ACE online teachers' course	More	Better
Distance education—Anatomy and Physiology	On a par	Better
Distance education—International Hotel Management	More	Better
Mixed-mode delivery		
ACE ESL Environment	More	Better
AMES—CSWE	Less	Better
Mixed mode—Anatomy and Physiology	Less	Better
Mixed mode—International Hotel Management	On a par	On a par

Information relating to costs was broadly separated into establishment and recurrent costs. The former included not only capital costs but also the cost of planning and development. Capital expenditure required to deliver online learning typically involves providing networked computers linked to the internet. However, in most instances this expenditure do not relate solely to participation in online delivery.

Establishment costs

All of the case studies noted that development costs are significantly higher than those required for the development of a traditionally delivered course. As the instructor for the ACE ESL course noted, developing the materials for online presentation required a considerable upfront investment of time compared with traditional teaching methods where the teacher can prepare learning materials immediately before each class. Extra time was also needed to prepare material for general distribution as online courses are on the internet for anyone to see and access. In some cases, the development costs are hidden because the course was developed using existing resources (a staff member, using work time and partly on her own time).

In several cases, significant resources were devoted to developing online courses from scratch. In the case of Department of Animal and Biological Sciences at Box Hill Institute, funding allowed for a total of 400 staff hours for online resource development using a content writer, an online expert, a programmer and a graphic artist. Staff estimated that this represents a 100% or more additional expense compared with course development for face-to-face delivery alone. The development of flexible learning resources for the OTEN IT-PC Support was mostly funded by a grant of $200 000 from ANTA. A further $100 000 was spent on website development and project management.

The ACENET case study report estimated development costs on a project-funding basis, independently of any institutional support or overheads. The costed conversion of an existing course to an online course was estimated to be $750, representing 15 hours work at $50 per hour. However, as there is likely to be more involved in developing an online course than merely converting existing materials for uploading to a website, this is likely to be an underestimate. The development of an online course from scratch for delivery entirely via the internet was costed by ACENET at $2400, representing 48 hours work at $50 per hour. This represents a fixed cost and does not vary with the number of students who take the course.

The project-based costings provide information on other important development costs; for example, the need to fund the teaching of tutors in online delivery to provide support for entirely online courses. These are variable costs which will change with the size of the class being taught online.

Recurrent costs

A number of the aspects of recurrent costs of delivering a course online differ markedly by whether the course is conducted in a classroom or in distance education mode. The evidence from the case studies suggests that the recurrent costs of a mixed online delivery mode in a classroom setting could be double or more than that of face-to-face delivery alone. The greater level of preparation required, the more intensive nature of the online interaction (for example, need to answer student emails), and the provision of help with the software are all additional time-consuming tasks. Failure to note the new work processes involved can result in failure to anticipate major time and hence cost blowouts. Navarro, based on United States evidence, has told how many instructors involved in online learning are drawn into an 'endless time drain' (Navarro 2000, p.129).

This finding is confirmed in an Australian setting by an incident reported by the ACENET co-ordinator where an instructor was contracted to run a course 'Introduction to the internet', available through TAFE VC. Forty students enrolled in the course. However, due to the limited language and computer skills of the students, the unit had to be customised to meet their specific needs. This was done while the course was in progress. ACENET initially had budgeted to pay him $1000 for his work. However, it was not anticipated that throughout the course he would receive approximately 500 emails from students requiring help. As a result, the instructor suggested a more appropriate fee for the course would be $4500. ACENET was unable to pay him this amount and so a halfway figure of $2500 was agreed upon.

Where new work functions are not identified separately and instructor and a 'help desk' function are combined as one work role, the application of a traditional funding model based one of the performance of one of these functions only—the traditional teaching role—is likely to result in a cost blow-out. Face-to-face teaching, in contrast, is a low-cost operation with few hidden or indirect expenses.

By contrast, online delivery for students in remote locations, appears on the surface, to be a low-cost operation because it does not include the fixed costs of classroom space, set lecturing times or printing costs. However, the OTEN estimates rate an online remote course to be twice the cost of a traditional distance education course due to the extra level of support required. Again, this is due to the extra time required for instructors to respond individually or via broadcast to a greater number of inquiries from students—made possible through inexpensive email.

Effectiveness

Learning effectiveness was assessed in terms of working and completion rates, where available. In the Box Hill and OTEN case studies, these were shown to be better than the completion rates for the traditional delivery modes.

The more common approach was to seek information from the learners about their perceptions of different aspects of the course compared with traditional delivery methods. The strongest form of evidence of learning effectiveness was the comparison of student ratings from the online courses and TAFE graduates overall on the same items about different aspects of training quality. The summary evidence based on student survey data are reported in table 11. On the overall quality of training received, satisfaction rating of students in each of online courses is close to or better than the overall satisfaction rating given by all TAFE graduates in 1999. The online courses delivered in a classroom setting (ESL Environment, CSWE) achieved scores far higher than the national average. The courses delivered solely online (ACE online, OTEN IT PC Support) or with some students involved in remote online delivery (Anatomy and Physiology) scored on a par with the national average.

The OTEN IT course scores 7.5 out of 10 compared with a national average satisfaction rating of 7.9. However, the more appropriate comparison would be against the average for traditional distance education courses. The high OTEN IT (PC Support) course rating, in fact, suggests that online delivery for remote students has the capacity to reach the level of satisfaction expressed by students who have participated in face-to-face delivery.

The variations in the satisfaction ratings for particular items related to quality, particularly in relation to the courses delivered entirely online, suggest that there is scope to improve different aspects of the training delivery. In particular, the lower ratings for presentation of training material or subject matter reflects industry practice for the ACE online and OTEN IT (PC Support) courses suggest that these are aspects that could be improved.

This finding about the effectiveness of online learning, especially in relation to mixed-mode or classroom-based delivery, is consistent with the evidence given to the Web-based Education Commission by the Director of the Sloan Foundation, an organisation that has provided over $US 35 million in grant support to over 50 higher education institutions to fund programs in online learning:

> *… based on our considerable experience, and based on experience with classes that are taught on campus and on internet by the same instructor giving the same examinations, on balance, we do not find any significant variation in learning effectiveness between classroom and online courses taught in the interactive mode.* (Mayadas 2000,p.3)

Table 11: A comparison of student satisfaction ratings with the national average satisfaction ratings of TAFE graduates 1999 (ratings out of 10)

Aspect of training	National	ESL Environment	CSWE 1999 & 2000	OTEN IT	ACE online	Anatomy & Physiology
Instructors' knowledge of subject content	8.2	9.7	8.9	7.4	9.4	8.4
The subject content reflects industry practice	7.6	7.0	8.6	6.5	8.3	6.5
The presentation of training material	7.5	8.9	8.6	7.1	6.0	6.8
The quality of the equipment provided for you to practise your skills	7.3	9.2	8.9	6.8	7.9	5.5
Having enough equipment for you to practise your skills	7.2	9.6	8.9	7.3	8.6	6.2
Access to learning resources	7.8	9.6	8.9	7.4	7.9	6.2
The convenience of both venue and class times	7.7	9.7	8.8	6.5	8.5	6.4
The usefulness of the training for your job prospects	7.7	8.7	8.7	7.8	8.5	6.9
The overall quality of the training you have received	7.9	9.8	8.8	7.5	8.0	7.8

Source: NCVER (2000)

Two broad approaches to cost-effective online learning

These results suggest that two broad models of cost-effectiveness are identified. In relation to classroom-based mixed-mode delivery, where there is low interactivity and heavy reliance on content, courses tend to be high in cost compared with traditional classroom instruction and low on effectiveness in terms of student satisfaction. On the other hand, where there are high levels of interactivity using the internet and pre-existing web-based resources, the costs are often lower or at least not greater than traditional classroom instruction. In the latter instances, students rate effectiveness more highly compared with conventionally taught courses.

In relation to distance delivery, the contrast is between the traditional correspondence model with its low interactivity and heavy reliance on content and online delivery with its potential for high levels of interactivity. Evidence from one case study suggests that using online communication for distance learning to provide high levels of interactivity can cost about twice that of a low-interaction, print-based correspondence course. However, learning effectiveness ratings are better than low-interaction, traditional distance education courses and are on a par with the student satisfaction levels for classroom-based courses.

Strategies to improve cost-effectiveness

Rumble (1988) in comparing the cost-effectiveness of distance education with conventional education has noted that economies of scale can only be achieved if:

- the variable cost per student is less than that found in conventional systems operating at a similar education level
- the number of students is large enough to bring down the average cost per student to a level where it is lower than the average cost found in conventional educational systems
- dropout rate is kept at a reasonably low level
- the fixed costs are kept at or below the level where it is 'competitive' with the average cost per student in conventional educational systems

According to Rumble (1988), the issues likely to affect relative costs between distance education and conventional media are choice of media in terms of not only its absolute costs but also its effect on average student costs. In other words, if the upfront costs are high, can the average cost per student be decreased by increasing the number of students served by the new media. Another likely factor to affect costs, notes Rumble, are the resources put into student services. Since these costs are variable, the degree of investment in student support services has to be weighed against the effect on the average cost per student and on dropout rates.

> *a distance [education] system may cost more in absolute terms than the conventional systems with which it is being compared, but it can be more cost-efficient because it has sufficient students to bring the average cost per student down below that of conventional systems—thus making it more cost-effective.* (Rumble 1988, p.258)

Shepherd (1999) has highlighted three strategies for improving the cost and effectiveness of online learning. These are to:

- reduce costs (while maintaining current levels of effectiveness and volume)
- improve effectiveness (while maintaining current levels of cost and volume)
- increase volumes (while maintaining current levels of cost and effectiveness)

He notes that each of these strategies produces gains without associated losses. Ways in which online learning could save costs include reducing the time it takes to learn and, for enterprises in particular, by reducing delivery costs because, for example, no classroom space is required and by reducing travel and accommodation costs. However, he also notes situations where costs are not reduced by online learning: where the design and development costs are too high for the size of the audience and where the online tutoring support provided is highly individualised and intensive (Shepherd 1999, p.1).

Online learning to be effective has to meet certain conditions. Shepherd (1999) identifies four factors important to the effectiveness of online delivery: individualisation, immediate constructive feedback, active learner involvement and an appeal to multiple senses. He notes the following situations where online learning may result in less effective learning:

- where the method is mismatched to the stage in the learning process, for example, online learning may be alright for presenting the topic but not for practising it
- where the method is mismatched to the learning style of the audience
- where the method is mismatched to the type of learning, for example, using online learning for psychomotor skills, such as riding a bike
- where the method does not provide the right mix of media for the topic, for example, teaching language skills may require audio or teaching face-to-face selling skills may require use of a video

An increase in the volume of people trained may be an important strategy in situations where a large number of people has to be trained in a short time (such as a change of business), where there are many unmet training needs (for example, minority groups) or where online delivery is a way of reaching out to new and untapped markets, not necessarily within the normal geographical catchment area of the market in which the training provider operates (Shepherd 1999, pp.3–4).

Strategies to reduce costs

The case studies suggest there are several ways to reduce costs provided courses meet designated standards to ensure effectiveness is maintained, such as meeting the 24 quality benchmarks recently identified by a United States study. One means of doing this is to identify the range of new work roles required by online delivery and to assign work on the basis of the required skills.

In this regard, the AMES case study offers some valuable insights. One key reason the implementation of online delivery entails additional costs, particularly in attempting to diffuse the innovation to a larger group within an organisation, is the cost and difficulty of replicating the multi-skilled innovator. The case studies demonstrate that a common pattern for online adoption is that the initiative emerges from the efforts of an individual teacher who has acquired the skills required to set up and operate online. For a variety of reasons, producing other multi-skilled innovators is not possible and so hinders the take-up of the new learning mode on a larger scale. AMES has responded to this cost and organisational constraint by working out ways to redesign the work process to achieve more cost-effectiveness outcomes.

A six-step process for identifying how to change work roles to achieve a lower cost outcome can be identified from the AMES case study:

- identify the key skill sets or roles required by the new learning mode
- redesign work roles to make it more cost-efficient to spread the new learning strategies throughout the organisation
- identify those skills the most difficult to replace or reproduce and those that are relatively easy to transfer
- set up a special position to retain and further foster the skills most difficult to reproduce
- identify and define the new work roles involving the more easily transferable (and less expensive) skills
- select people for those work roles whose skills match those required by the new work role

This final step is also likely to involve providing opportunities for the new work role to enable incumbents to learn on the job through mentoring with the initial innovator.

The OTEN IT (PC Support) case study referred to the need to develop industrial arrangements that reflect the realities of the online environment. It was pointed out that this would not only make a fairer distribution of costs possible, but also make it easier to ensure the full potential flexibility of the delivery method. The case study noted that further cost-efficiencies could be secured through the greater involvement of non-teaching staff in performing certain roles, such as monitoring emails and responding where appropriate, and website maintenance. However, there is, at present, no industrial classification in the NSW TAFE award for a teacher's assistant or technical support person.

A close examination of the work process reveals a range of opportunities to reduce costs. Redesigning the work process to change how student support services are delivered is another way to reduce costs. Enabling relatively simple help desk functions to be performed by lower-cost personnel can do this. Encouraging the greater use of asynchronous discussion groups within a course may also make it easier for students to help each other and therefore take the pressure off the instructor.

At an institutional level, upfront investment in new systems can offer ways of reducing, across the whole institution, the fixed costs associated with course design and production. Again, the AMES case study offers an example. The Virtual Independent Learning Centre (www.virtualilc.com) contains a range of up-to-date online products in a variety of media for teachers, learners and other training providers. The Virtual ILC brings together the work of experienced teachers from around Australia to allow teachers and learners to use their internet time most efficiently.

The University of Southern Queensland (USC) offers another example of organisation-wide systems development designed to reduce fixed costs. USC is developing an automated courseware production system to permit cross-media publishing (for example, print, online, CD) from a single document source based on an integrated document management, workflow and content editing (Taylor 2001, p.6).

Another means of improving productivity through better work organisation is to use software to reduce the time instructors are required to spend answering students' individual email queries. This can be done by instructors making use of automated response systems. Taylor notes that storing the information generated by a threaded online discussion in a relational database is technically straightforward, and provides a rich resource for mining by key word/matching, so that pedagogical resources can be used to assist new students time and time again through the operation of an automated response system (Taylor 2001, p.7). This process of capturing information and turning it into knowledge that has value through its capacity to be applied in other settings or contexts can be operationalised at a higher institutional level, as another USQ innovation demonstrates:

> *Our work at USQ has reached the poin, where we have developed prototypes of what we refer to as intelligent object databases, which can be searched by pre-specified key words. Upon receipt of an electronic query from a student, the search engine seeks an appropriate match with a previously asked question, which if successful, triggers a personalized response to the current question without concurrent human intervention … If no appropriate match is discovered in the database of previously answered questions, the query is automatically routed to the relevant tutor for an appropriate response, which is then added to the database with a single point and click. Depending on the pedagogical design of the course, these responses can be directed to the whole cohort of students, to groups of students, or to individuals. The system has the advantage of providing more-or-less immediate pedagogical advice to students, a significant increase in institutional responsiveness, at minimal variable cost.* (Taylor 2001, p.7)

Scope for improvements in fixed costs are likely to also come with the development of standardised education technology packages (for example, hardware, software, training, service support, online content, and internet services). Other costs involved in the time spent in planning, installing, managing, and upgrading systems are also likely to reduce over time as integrated packages address the complexity of the planning required (US Secretary of Education 2000, p.122). Lower costs are also likely to come from the development of an efficient network architecture which will make it easier to build economies of scale. The United States Web-based Education Commission (US Secretary of Education 2000, p.122) reports that the use of better network and communications backbone architecture is critical to lowering communications costs.

Single point access for all users

The OTEN IT (PC Support) course case study noted that the course website did not link with student management/administrative systems, thereby necessitating the use of a relatively complex manual reporting system to keep records of assessment events for submission to the TAFE student information system via a hand-completed mark sheet. The case study noted that integration with 'back office' administrative systems would enable major efficiencies to be achieved for both administrative staff and instructors. Systems which can integrate online courses with other systems for managing enrolments, tracking students' progress and payment purposes will reduce variable costs. Comprehensive online environments for unifying administrative services, student services and online learning within one institution and between institutions will be the standard in the future for defining a digital campus. This is best typified by easy, 'single-signon' access to a broad range of services for all users, from students, to lecturing staff and administrative staff is the standard expected of a digital campus (Business Wire 2001). However, it needs to be acknowledged that the implementation of such integrated systems, like other efforts at achieving integrated enterprise platforms, often involve significant costs.

Strategies to increase effectiveness

The case studies also provide insights into how to improve learning effectiveness while not exceeding current cost and or reducing volume levels. The level and amount of interactivity was identified by several case studies as the key to improved effectiveness. Moore (1993) suggests that there are three types of interaction necessary for successful distance [or online] education:

- learner–content interaction
- learner–instructor interaction
- learner–learner interaction

To improve learning effectiveness online instructors need to ensure that all three forms of interaction are maximised in their course structure.

The case studies reported a shift away from learner–content interaction to a greater emphasis on the other two forms of interaction. The AMES case study noted that finding suitable websites to provide links for different aspects of the course was resource-intensive. It was decided therefore, to reduce costs by cutting back in the 2000 course on the number of web links used in the online learning tasks. However, this did not adversely affect learning effectiveness. A comparison of the student satisfaction ratings for the course in 1999 and 2000 showed that, in fact, the rating (out of ten) for the presentation of training material increased from 8.3 to 9.1.

The case study of the Regency Hotel School in Adelaide noted that the initial emphasis was on the provision of high levels of multimedia presentation. However, with time, the team moved to a new appreciation that successful online delivery is largely dependent on good basic instructional materials and quality facilitation by the instructor. If the development team were to write the same nine modules for online delivery with this new perspective, upfront costs would be considerably reduced.

The OTEN IT (PC Support) case study showed that, having attained a high level of effectiveness in terms of module completion rates, a subsequent reduction in 2000 in the level of contact between instructors and students caused a notable fall in the effectiveness rating. As a result of staff shortages, the level of learner–instructor interaction was reduced. Teachers were no longer linked to specific modules, the amount of assistance available from the help desk was lower and newsletters were no longer issued. The result was a marked drop in the module completion rate (from 72% in 1999 to 50% in 2000). Lower student satisfaction levels compared with overall satisfaction ratings provide other confirmatory evidence of the adverse learning outcome due to the reduction in learner instructor interaction.

Assessment is another aspect of course delivery where more use of online interactive tools enhances learning effectiveness. With online delivery, the Anatomy and Physiology course offered by the Box Hill Institute had markedly improved module completion rates. The students' survey responses showed that interactive assessment quiz was rated as the aspect of the course with which they were most satisfied, scoring 8.6 out of ten. Most students identified a key benefit of online learning as their capacity to complete learning tasks when it suited them and at their own pace.

The report of the Web-based Education Commission has criticised the current forms of assessment as a major obstacle to improving learning effectiveness.

> *Perhaps the greatest barrier to innovative teaching is assessment that measures yesterday's learning goals. It is a classic dilemma: tests do a good job of measuring basic skills, which, in turn, influence the teaching of these skills so students can score well on the tests. Testing works well so long as we are testing the right things.* (US Secretary of Education 2000, p.59)

The report points out that advances in testing technologies have made it possible to extend test item formats beyond the selected-response formats of past test designs. For example, through web-based testing a student may be asked to design a building to meet a set of constraints, or to troubleshoot a faulty system. With computer adaptive testing, the test 'adapts' to the examinee's performance on it. The individual is given a question, and, if he/she answers correctly, the move on to more difficult questions. Incorrect responses generate less difficult questions. Information is stored on the computer and the score reflects the skill level achieved.

Computer-adaptive testing is increasingly being used in the USA in enterprise-based training and for professional certification (including medicine) (US Secretary of Education 2000, p.60). Assessment of student performance can be embedded, almost seamlessly, into online courses to provide instant and continuous feedback, thus providing a powerful incentive to learn.

Strategies to increase volume

Strategies to increase volume while maintaining current levels of cost and effectiveness can also be also implemented. With higher fixed costs for online delivery (due to, among other things, more time required for the preparation of course materials), a major impact on the average cost per student can be achieved by lifting student numbers. However, much depends on existing institutional constraints. Where online delivery involves a significantly higher absolute cost, and volume cannot be increased within existing operating parameters, it is likely to be cheaper to use conventional delivery methods.

The Qantas College Online case study illustrates how online delivery could be used to increase volume without increasing costs. Managerial resistance to staff release from the workplace for training was identified as a key barrier to supporting change in the organisation. Online learning was viewed as a key means of increasing the opportunities to train and to distribute access to training on a global scale without incurring a huge infrastructure cost. The result is, that nearly a quarter of Qantas's 30 000 staff has expressed interest in taking an online course. The expansion in numbers came from the fact that nearly half (47%) of learners had undertaken their online course at home and nearly four-fifths (78%) had undertaken it in their own time. However, the low completion rate suggests that ways to improve learning effectiveness may also need attention.

However, none of the publicly funded case studies provides an illustration of how online delivery has enabled class sizes to be increased where they are delivered on campus. Nor do they provide examples of an increase in the numbers of distance education students compared with conventional distance education methods. This reflects the lack of compatibility between the requirements of a flexible delivery system and present funding models based on student contact hours (Stewart-Rattray, Moran, & Schueler 2001, p.19).

The other aspect of improving volume is the capacity of online delivery to tap markets previously beyond geographical or temporal reach. The Regency Hotel School case study demonstrates the success of a strategy which has, despite its initial start-up costs, been able to attract students from around the world who are prepared to pay full commercial fees for the course. The other client group the online degree course was able to tap were full-time employed staff within Australia with demanding work schedules. Online delivery has the potential to command high fees if it is delivering vocational skills that are in demand and well remunerated and the delivery mode suits students' working and family commitments.

Conclusion

The case studies have demonstrated the learning effectiveness of online learning. The evidence presented has varied from the perceptions of a range of student groups varying from those with basic literacy and computer skills, to students with a strong interest in computers and students taking degree-level courses. Evidence of learning effectiveness also applies to courses that ranged from general education (for example, ESL Environment, Certificate of Written and Spoken English) to those with a specific vocational focus (for example, Anatomy and Physiology, International Hotel Management, and PC Support). The background and motivation of the students varies from job seekers seeking additional skills, full-time students seeking occupational skills and employees wanting to improve their career options within a large enterprise.

The information on costs was more difficult to identify. The difficulties experienced in collecting appropriate data have been noted more generally by Stewart-Rattray, Moran, Schueler (2001, p.3.) who have commented that 'there is a lack of understanding of what information is required to manage and measure the success of flexible learning'. They note that managers often 'do not know what they do not know about flexible learning and its outcomes'.

Despite the limitations of information on relative costs, two broad models of cost-effectiveness can be identified. Where there is low interactivity and heavy reliance on upfront content, courses tend to be high in cost compared with traditional classroom instruction and low on effectiveness in terms of student satisfaction. On the other hand, in a classroom setting where there are high levels of interactivity using the internet, and the use of pre-existing web-based resources, there is a greater potential for costs to be lower and on a par with traditional classroom instruction costs, with effectiveness rated by students as better than conventionally taught courses. However, cost-effectiveness will depend on increasing student numbers or otherwise reducing the costs of the resources deployed while maintaining effectiveness levels. This in turn will require identifying new work functions required by online delivery and applying lower cost inputs. Also important will be productivity gains from better use of software, such as the use of a relational database to provide automated or semi-automated responses by email.

Where online learning is conducted in a distance education mode, high levels of interactivity will be more expensive than in a largely print-based correspondence course. However, learning effectiveness, assessed in terms of student satisfaction levels, will be much better than low-interaction, traditional distance education courses. Strategies for improving the cost-effectiveness of online delivery need to focus on finding an optimal combination of ways to simultaneously reduce costs, improve effectiveness and increase student reach.

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The cost-effectiveness of mixed-mode delivery at the margin: AMES Victoria

Richard Curtain

Overview

The focus of this case study is an advanced level course for non-English-speaking migrants conducted by the Victorian Adult Multicultural Education Services (AMES). The course utilises a mixed delivery mode, combining the use of online learning materials with the traditional face-to-face method in a classroom setting. The mixed mode of delivery has been highly effective in terms of eliciting a strongly favourable student response. Students' interest in learning has been greatly enhanced through the use of online materials and the increased levels of interactivity the internet offers. The case study also shows that student satisfaction ratings on a range of aspects relating to the quality of training in the online course are consistently higher than the satisfaction ratings given by NCVER TAFE student outcomes survey.

The main purpose of the case study is to assess the cost-effectiveness of changing from a traditional to a mixed delivery mode within an organisational setting that is already strongly supportive of online delivery. In other words, given that the infrastructure is already in place, what is the additional cost at the margin of converting an existing well-established course and what is the impact of this new teaching method on learning effectiveness. The case study demonstrates how identifying work roles has reduced costs by re-allocating staff to minimise wages costs. The case study also shows that this re-allocation of work roles has not lessened learning effectiveness, with the new method of learning in fact producing higher levels of student satisfaction compared with face to face teaching.

This case study suggests that one reason for the high cost of online delivery is the failure to identify and unbundle the type of resources needed. The skills and costs associated with face-to-face delivery are different from those needed to develop and deliver online learning. Development and delivery of online learning uses a range of skills not required by the traditional delivery modes of 'chalk and talk'. The new skills relate to writing up materials, graphic design, software systems know-how and course presenter. In the experimental stage of introducing a new technology, these different skill sets are often bound up in one person—the innovator. However, the 'bedding down' of the innovation requires a careful appraisal of who does what and whether less expensive options can be utilised to perform the same set of new tasks.

One effect of online learning is that the role of the teacher changes from being the centre of attention to become more of a facilitator with the main direction coming from the online material. This means that it is possible to use a teacher's aide as the support person in the classroom for at least some of the time. This frees up the more expensive resource of the innovator who is an experienced and more multi-skilled instructor for developmental work. Using a teacher's aide instead of a teacher has reduced the wage costs by 30% for the hours the teacher's aide is involved. Other savings have been achieved by utilising the self-directed nature of online learning to remove the requirement for a support person to assist students during the time they are allocated to spend in the independent learning centre.

The case study also demonstrates, at an organisational level, how cost-effective outcomes depend on a system-wide strategy to produce online resources that are not just for internal consumption but are targeted at a wider market. In this way, development costs are offset by the fees earned from other training providers for access to the materials. The case study also highlights the importance of certain supporting conditions needed to help reduce costs and improve learning effectiveness. These include the importance of internal champions and the value of reliable back-up technical support.

Background

Most migrants and refugees settling in Australia are given an entitlement funded by the Commonwealth Government to tuition of up to a maximum of 510 hours to enable them to achieve 'functional' English. Under the Adult Migrant English Program (AMEP), eligible migrants and refugees are provided with reading, writing, speaking and listening skills to a level to help them settle satisfactorily in Australia. Clients also receive information on the Australian way of life and advice on accessing essential services.

AMES in Victoria has been funded under the AMEP since 1951 to provide English language training for migrants from language backgrounds other than English. The services AMES now offers range from helping individuals to access nationally accredited language and TAFE training programs, obtaining recognition for overseas qualifications, career planning and assistance with entering employment. Most of the accredited vocational education and training course offered by AMES recognise the special needs of its clients by also including advanced English study. AMES offers also offers specialised short courses in foreign languages, communication skills and computer training.

AMES, to respond to its diverse client base, has developed a particular strength in flexible learning strategies. The clients served by AMES present a particular learning challenge because of often diverse cultural traditions within one student group, variable educational ability in the migrants' first language, teaching expectations and personal feelings associated with the migration experience. The special needs of the client group have encouraged AMES to develop a strong learner-centred set of strategies that aim to meet each individual's own ability to learn. This customised approach is reflected in course delivery at convenient venues, at times suited to the needs of the client group, and utilising learning strategies that focus one to one interaction in the classroom and through independent learning centres.

AMES operates from 14 centres throughout Melbourne in areas where migrants are likely to be located. Students can attend on a full-time and or part-time basis. Class timetables are planned to suit clients' preferences. Classes are held at different times of the day and evening, six days a week.[1] English language classes are also delivered in workplaces, often at times to fit in with afternoon and night shift work. The option of studying at home using distance learning materials is also available, often with the support of a volunteer tutor.

Most AMES centres also operate an independent learning centre. These centres, through the services of a support person, offer guidance to the individual learner through easy access to appropriate print materials or computer-assisted learning programs. The centres are often open on weekends and offer support through a trained resource person.

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[1] The industrial award governing AMES Victoria's employment states that teaching staff are required to be available for duty for 52 weeks, with the attendance pattern of a teacher being determined by AMES at the beginning of each semester. Teachers are required to be in attendance for an average of 38 hrs per week and may be required for up to 42 hrs in any one week. Ordinary hours are between 8 am and 9 pm Mon to Fri and 8 am to 5 pm Sat. Teachers may be required to teach two evening a per week. Special pay rates apply for hours worked in excess of 42 per week.

Organisational support for online delivery

AMES, though a specialist unit, Online AMES, that services the whole organisation, creates and maintains a range of online products for teachers, learners and other training providers. The unit also manages the delivery, administration and support of online learning. Students who are unable to attend classes in person can log on and complete their class work online, and get feedback from their teachers. Students in class can also supplement and extend their learning through Victoria's TAFE Virtual Campus.

Online AMES, in association with the Special Broadcasting Service (SBS) and others, has created a Virtual Independent Learning Centre. The Virtual ILC is a website that contains an extensive collection of English language learning tasks linked to world wide web pages or based on a weekly specially recorded version of SBS radio news. The Virtual ILC encourages students to use the internet on an everyday basis by bringing together the work of experienced teachers from around Australia to allow teachers and learners to use their internet time most efficiently. All tasks on the website are prepared by experienced teachers and are regularly updated. *Realweb* contains tasks linked to WWW sites for courses linked to the Certificates of Spoken and Written English (CSWE).[2] CSWE students are able to practise their skills by either choosing a specific competency they would like to work on, or by following a topic of interest and completing tasks based on that topic. Over 80 teachers have contributed over 600 tasks to the website.

Access to the Virtual ILC (www.virtualilc.com) is on a subscription basis for other English language training providers throughout Australia, from whom there has been strong interest.[3] In late 2000, there were some 150 organisations registered as users of the VILC. These include 75 migrant language providers funded by the AMEP, 30 TAFE institutes, and 10 universities, and 16 schools and languages centres. VILC users are located in Victoria, NSW, Queensland, New Zealand, Vietnam and Japan. The Virtual ILC has benefited from funding support in its developmental stage from the Commonwealth Department of Immigration and Multicultural Affairs (DIMA). However, it is seeking to cover its recurrent costs by expanding its subscription base by more extensive marketing. To make the VILC more attractive, particular attention is being given to improving the website to give it a stronger customer focus.

Nature of the course

The Certificates I, II, III and IV in Spoken and Written English have been used as the basis for teaching English as a second language courses since 1992. It is now the most widely used language and literacy curriculum in Australia, providing English language skills from beginner to advanced levels. Certificates are intended as a means of upgrading the English skills of non-English-speaking migrants to help them obtain entry to other courses. The Certificate IV in Spoken and Written English is a recognised entry point into TAFE mainstream courses. The content of the Certificate IV in Written and Spoken English offers advanced skills in communication, listening and reading for overall meaning. In addition, it offers specific language skills in relation to writing, pronunciation and grammar and study skills. Assessment is by a series of work requirements set throughout the course.

There are no specific entrance requirements. Candidates are first required to undergo an assessment of the English language proficiency and are rated according to the Australian Second Language Proficiency Rating (ASLPR) Scale. It is on the basis of this rating that they are allocated to a particular certificate level.

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[2] The addition of three new curricula to *Realweb* is planned for 2001: Certificate in General Education for Adults, Curriculum Standards Framework (ESL) and Certificate in Literacy and Numeracy.

[3] The fee for access to the VILC for one student is $100, for up to 12 students $250, and for up to 25 students $330, up to 50 students $550 and up to 75 students $700.

Online elements

The particular focus of this case study is the use of online components in the CSWE IV course at AMES Springvale and to AMES Oakleigh in Melbourne's eastern suburbs. The course is still at a developmental stage but once the course has been 'bedded down', it is likely to be extended to the other AMES centres. As noted above, this course uses online delivery as a complement to face-to-face teaching. The course requires student involvement of 22 hours per week. Students spend eight of these hours in a computer room taking part in online activities assisted by a teacher's aide; nine hours are spent in classroom in a traditional face-to-face classroom setting; two hours are spent under supervision in a computer room on information technology modules and the remaining three hours are classified as independent study in which the students can access the computers in the centre's library. Thus online delivery and use of online materials delivery accounts for over half (60%) of the course time.

The online aspects of the course influence both how learning is undertaken and how learning is assessed. The online forms of communication available include both synchronous and asynchronous forms. An example of synchronous communication is participation in a chat group. Examples of asynchronous communication are one-to-one email with the instructor and one-to-one email with other students. Learning tasks consist of assignments using material with links to web pages. Using web pages, students are also able to undertake assessment tasks that can be corrected immediately, thus giving them instant feedback and making it easier to undertake more independent learning. However, the main assessment task is still supervised and corrected by the teacher.

Costs

Information was sought from AMES Springvale management on the estimated differences in costs of online delivery compared with traditional face-to-face delivery. These ranged from establishment costs (such as equipment purchase price and installation), development costs (such as developing and revising learning materials) and recurrent costs (such as learner support, staff training and teacher technical support and enhancements to equipment).

Establishment costs

AMES Springvale management believes that, in terms of the establishment costs, online delivery has not required new expenditure on equipment. The costs of computer hardware and multimedia software cannot be regarded as an additional cost incurred by online delivery as current model computers and multimedia are already used for traditional classroom teaching. All of the courses at AMES involve the use of computers to some extent. What is additional is the connection of the computer to a network as part of an intranet or externally through the internet. However, it was also noted that the costs of maintaining a network by the organisation cannot be regarded as an additional cost attributable to online delivery. The cost of the network is better seen as an operational overhead as it is used as a basic means of communicating within the organisation.

Development costs are not possible to estimate because the online elements of the course were created by a staff member, partly on normal work time and partly on her own time. Sophie Cholewka, a teacher at AMES Springvale, undertook the development work as part of her normal duties. However, it was also a 'labour of love' and, therefore, involved a considerable amount of her own time. One expense covered by the centre was the purchase of a software package called *Dreamweaver* used to create interactive web pages such as self-correcting exercises. This software cost the centre $250. Another developmental cost is the upgrading of the course developer's skills in web page design. The original course developer is undertaking a course at Melbourne University on web-page authoring, which the centre is funding.

The CSWE IV course at AMES Springvale makes extensive use, in its course delivery, of the Virtual Independent Learning Centre. However, access to this significant resource is not a charge to AMES Springvale as it is funded from the organisation's central budget. However, access to the VILC for external users is subject to a fee for service.

Recurring costs

The cost of accessing the internet is an additional recurrent cost required by online delivery. However, it is not possible to identify this as an additional cost for a particular course as it is a service provided for the organisation as a whole. Nevertheless, one cost that does relate directly to the online delivery of a particular course is the cost of accessing the internet from away from the facilities. AMES does not cover this cost in whole or in part for internet access for those accessing the network from outside of an AMES centre. This cost is borne by the instructor and the student, usually in the form of paying for a connection to access the internet from home.

The main additional recurring cost in terms of its online course compared with face-to-face teaching for AMES Springvale is the constant need to upgrade the course. While major curriculum changes only occur once every five years or so, the online component of the course needs constant updating because links to web pages need to be checked and updated. Finding suitable websites to provide links for different aspects of the course is also time-consuming. So, to reduce this demand on time resources, one of the changes made to the course for 2000 has been to cut back on the number of links used in the online learning tasks. Updating material can also involve the use of staff time to follow up internet copyright issues. For example, using photos from another website requires permission to be sought. So far, AMES has not been charged for the use of others' work. In general, from a staff perspective, online learning compared to traditional teaching methods is regarded as more time-consuming.

Another aspect of recurring costs is technical back-up. The problems that can emerge in operating even a small batch of networked computers can require considerable amounts of time from costly technical personnel, especially when new software is being introduced. However, the AMES Springvale is fortunate in not having to rely on the central IT support. A former student, with the required technical expertise, provides assistance at minimal cost to help iron out any problems that may emerge in operating the network.

Reducing costs by changing who does what

Online delivery involves more than a simple application of a new technology. It also requires organisational changes to ensure that the 'best fit' is achieved, in this case the best cost-effective outcome. The way that AMES has implemented online learning shows that organisational changes are also needed to produce cost-effective outcomes. The use of online learning, in itself, is insufficient to produce benefits that justify the cost unless they are supported by other changes to work roles that reflect the new skill sets required.

The adoption of new technology requires that new forms of work organisation be adopted. Ways of working and supporting skill sets used for one mode of delivery are not likely to be suitable or cost-efficient for new delivery modes. This requires that established organisations learn to step back and work out how the innovation was introduced in the first place and the best way of spreading it through the rest of the organisation.

The AMES approach to achieving cost-effective outcomes for online delivery has been to separate the key functions required, define specific work roles within these functions and to encourage incumbents to develop specific skills related to these new work roles. AMES has identified three key functions at the individual course level associated with online delivery. These are: developer, deliverer, and technical back-up. Two other key functions at the organisational level are a web-based central repository of interactive learning tasks (the Virtual Individual Learning Centre) and the IT function to manage a reliable network.

New work roles can also be identified within each of these work functions. Within the developer function at course level, key work roles are materials writer or updater, materials and web-page presenter. Within the delivery function, two work roles are identified: the more traditional face-to-face teaching role and a support one to provide 'customer support' for students while they are engaged in direct online learning exercises. The third key function at course level is technical back-up. This requires tailored support for the software needed to provide, for example, interactive chat groups. This can require considerable time engaged in problem-solving, such as the ironing out compatibility problems and associated issues.

The delineation of these functions as separate work roles has resulted in several cost-effective outcomes. One is to release the original online course developer from her face-to-face teaching duties to enable her to concentrate on revising and updating the course. This has enabled the course to be delivered in another centre. The original course developer has also been seconded on a part-time basis as a key resource person to the VILC where her skills can be better utilised there. The course presenter's role as a face-to-face teacher engaged teaching an online learning course has been divided into two functions: the upfront teaching function and a support function. An experienced teacher acts as a facilitator for four of the eight hours spent in the computer room engaged in online exercises. For the remaining four hours allocated to online work, support with the online learning tasks is provided by a teacher's aide, an AMES graduate with computer skills. This arrangement enables the online course to benefit from a 30% lower wage bill for the four hours a week covered by the teacher's aide.

Another change, due to the availability of online learning tasks, is the new capacity for students to undertake their three hours of independent study time on the computers in the library without the need for a teacher to be present. So the wage costs in relation to these three hours for supervision of independent study have been saved through the use of online learning. These 100% wage savings for three hours together with the 30% lower wage cost of the teacher's aide for four hours have been estimated by centre management to result in an overall 20% lower wage cost for the online course compared with the wage costs of the traditional delivery mode.

Effectiveness

According to AMES teaching staff, the effectiveness of online learning can vary according to students' different acquired learning styles. It was claimed that the way in which the students handle the technology is often related to their cultural background. Students who come from European cultures in which independent learning is promoted tend to be more confident and gain more from the online activities. Those student from cultures in which the students are more used to learning through rote and in groups have more difficulty in learning how to benefit from online learning.

However, this observation also depends upon the educational background of the student. Regardless of the country of origin, students with high levels of education are more likely to be independent learners. Thus the effectiveness of the course is likely to vary according to the structure of the course (for example, number of assessment tasks), student's background (age, education level, cultural influences), and the teacher's experience with online delivery. In general, it has been found that the effectiveness of online delivery as a learning tool requires that the student has a demonstrated capacity to operate at a higher level of English language competence. The capacity to undertake a certificate course at level IV with entry based on demonstrated language proficiency appropriate to this level is an important prerequisite for achieving effective learning outcomes. In other words, the new online learning process has the potential to deliver more effective outcomes if the students have been selected beforehand on the basis of their capacity to complete the course successfully.

The online component also exposes the students to different ways of thinking and writing. Many of the students are from traditional cultures in which they have been taught to wait for the information to come to them. Online delivery challenges this way of learning. The students are able to access a variety of views on certain topics and can then make their own opinion. For example, during the recent war in Kosovo the students were able to access different websites to gain an understanding of different interpretations of the events. They could compare the views on American websites to the views in websites from other countries in the world.

Several other valuable learning outcomes for AMES students from online learning strategies were also identified. The online component provides variety in learning techniques and increases the students' interest. The students are also able to keep in touch with friends and relatives overseas through the use of email and are able to access newspapers from their country of origin. Parents who have participated in online learning are able to communicate better with their children about computers and the internet. The general impression gained by teaching staff was that the students appreciated the variety of materials provided through the variety of online materials. However, it was noted that many students made it clear that they did not want online delivery to take the place of face-to-face teaching as this was still regarded as an essential element of successful learning.

Results of the student survey

Students in the CSWE IV course in 1999 and 2000 were surveyed to seek their views on its effectiveness in terms of their learning outcomes. The CSWE IV 2000 students had still to complete their course when surveyed. The reason for surveying both groups separately was to assess whether there was any noticeable difference in perceived effectiveness between the courses. The 1999 course was the initial effort to introduce an online component and the 2000 course was updated and improved in the light of the 1999 experience. The older 1999 version of the course was less interactive, but more intensive as it had more online assessment tasks than the 2000 course. The same course has been taught by different teachers. In 1999, the teacher was more experienced with better computer skills. In 2000, less experienced teachers new to this mode of delivery ran the course.

Most of both the 1999 and 2000 course respondents responded (18 out of 20 and 21 out of 23 respectively). Most students are adults (95% are aged 20 years or more – with 60% aged 25 years and over). Some 80% of the students have completed Year 12 or its equivalent (but this varied between the 1999 and 2000 intakes where the proportion is 67 and 90% respectively). For nearly all the students (87%), CSWE IV course was their first experience in online learning. In terms of the forms of online activity, most students had participated in chat groups (94% for the 1999 class and 76% for 2000 class), one-to-one email with their instructor (82% for both groups) and with each other (77%).

Student perceptions of effectiveness

Students were asked to rate which aspect of the online activity that they found most valuable in 'helping you to learn'. The aspect that received the highest rating was 'for learning course content' (77% rated it as valuable or most valuable). Other aspects that attracted high ratings are: use of online for assessment purposes, participating in chat groups and one-to-one email with the instructor (two-thirds rated these aspects as valuable or most valuable). The least valued aspect was one-to-one email contact with fellow students, only important to just over half (56%) of respondents.

Students were asked to compare the traditional delivery mode with online delivery and gave higher ratings to the former. In response to the question, 'how valuable was the face-to-face contact you had with your instructor in helping you to learn', 90% rated the traditional mode as valuable or very valuable. By contrast, only just over half (54%) rated as valuable or highly valuable online or non face-to-face means of contact as a help in the learning process. However, despite the lower value placed on online activities, students were still positive about online delivery. In response to the question 'would you like to do more courses or modules in the future that are delivered online', 90% answered in the positive.

Students were asked to rate on a five-point scale statements in relation to what they had learnt from the course. Most students agreed that they had improved their ability to use computers and the aspects of internet use as a result of the course. While 44 said that they knew how to use a computer before starting the course, 87% said that the course had increased their ability to use the computer. Similarly, while just over a third (36%) of students said that they knew how to use the internet before starting the course, 90% said the course had increased their ability to use the internet. Between two-thirds and three quarters of the students agreed strongly that the course had improved their ability in relation to computers and the internet use.

Online delivery as a learning tool, however, did not receive the same strong endorsement from the students as their perceived ability to use computers, the internet and email. While two-thirds of students agreed that 'online delivery helps me gain a better understanding of course material than if it was delivered traditionally' and 'online delivery helps me learn more relevant information than if this course was delivered traditionally', the proportions who strongly agreed were less than for the first three statements about using the computer and the Internet. Nearly two-thirds (64%) agreed that 'online delivery helps me understand information quicker than if this course was delivered traditionally', 23% strongly agreed with this statement (see table 1). There was strong support for the statement that 'use of technology increases my motivation to work' (82% agreed). Confirmation of the value of online delivery is also shown in the strong support for the two statements: 'because this course was delivered online, it was easier for me to complete' and 'I would take another course that was delivered online'. Some three-quarters of the respondents agreed with these statements and about 40% strongly agreed with them.

Table 1: Proportion of CSWE IV students in 1999 and 2000 agreeing with statements about aspects of the effectiveness of the course, by %

Aspect of effectiveness rated	Agree strongly	Agree	Total agreed
Online delivery helps me gain a better understanding of course material than if it was delivered traditionally	38	31	**69**
Online delivery helps me learn more relevant information than if this course was delivered traditionally	33	36	**69**
Online delivery helps me understand information quicker than if this course was delivered traditionally	23	41	**64**
The technology increases my motivation to work	46	36	**82**
Because this course was delivered online it was easier for me to complete	38	36	**74**
I would take another course that was delivered online	41	33	**74**

Table 2 highlights the importance of interactivity to the students. Most students found it easy to communicate within the course (four out of five students found it easy to communicate with the teacher and were confident in doing so). Nearly three-quarters of the students (72%) agreed that 'online delivery gave me faster feedback on my work than if the course had been delivered traditionally'. Two-thirds (69%) agreed that 'online delivery improved my access to the teacher or instructor'. This finding about the effectiveness of online delivery as an aid to communication was stronger for the CSWE IV 2000 class where 81% and 77% of students respectively agreed with the two statements. Online delivery also helped most students to communicate with other students and to link with others outside the classroom.

Table 2: Proportion of CSWE IV students in 1999 and 2000 agreeing with statements about internal communication within the course, by %

Aspect of effectiveness rated	Agree strongly	Agree	Total agreed
Communicating with the teacher is an easy process	64	15	**79**
I am confident in communicating with the teacher	62	23	**85**
Online delivery gave me faster feedback on my work than if the course had been delivered traditionally	41	31	**72**
Online delivery improved my access to the teacher or instructor	31	38	**69**
Communicating with other students is an easy process	46	36	**82**
I am confident in communicating with other students	59	31	**90**
Online delivery has helped me to link up with others outside the classroom	31	28	**59**

Online delivery offers considerable benefits to students in terms of the flexibility. What this flexibility consists of is shown in the following responses (see table 4). Students were most likely to agree that 'the course allows me to complete my work when I want', 'flexibility in the time spent working on this course helped me to learn better', 'I was able to do my learning when it suited me'. The capacity to not have to go to an AMES centre was the least favoured aspect of flexibility. It appears that most CSWE IV students still preferred to the interaction that face-to-face classroom contact provided.

Table 3: Proportion of CSWE IV students in 1999 and 2000 agreeing with statements about skills development as a result of the course, by %

Aspect of effectiveness rated	Agree strongly	Agree	Total agreed
My ability to express myself in writing has improved since starting this course	54	23	**77**
I am better able to explain concepts when writing than before I started this course	36	28	**64**
My ability to organise myself has improved since starting this course	38	31	**69**
Throughout this course I have always completed my assessment tasks on time	36	49	**85**

The increased flexibility provided by online learning did not include shorter learning times. Just over a majority of students (56%) agreed that 'on average I spent more time doing this course than if it had been delivered traditionally'. However, most who agreed with the statement made a point of rating it as merely agreeing (44%) rather than strongly agreeing (13%). Consistent with other findings, most students (80%) agreed with the statement that 'I am achieving at the level of my expectations'. Students were also asked whether they were intending to complete the course. Among the current students, only one respondent did not intend to complete the course.

Table 4: **Proportion of CSWE IV students in 1999 and 2000 agreeing with statements related to the flexibility offered by online delivery, by %**

Aspect of effectiveness rated	Agree strongly	Agree	Total agreed
The course allows me to complete my work when I want	51	36	**87**
I like not having to go to a campus for classes	21	26	**47**
On average I spent more time doing this course than if it had been delivered traditionally	13	44	**57**
Flexibility in the time spent working on this course helped me to learn better.	41	36	**77**
I was able to do my learning when it suited me.	41	33	**74**
I am achieving at the level of my expectations	31	59	**90**

Students were also asked to rate aspects of their training using items from the NCVER student outcomes survey. Students were asked to rate the nominated aspects of training using a ten-point scale with following categorisation of the benchmarks. Table 5 compares the ratings given by the 1999 and 2000 CSWE IV students (n = 34) with the ratings given by students nationally who completed their course during 1999 and graduated with a qualification from a course (n = 41 600).

A comparison of each of the specific training aspects rated by both populations in table 5 shows that the CSWE IV course outscores the national average on each training aspect rated. The results show that the CSWE IV course using online delivery methods scores better than the ratings given for graduates for all TAFE courses. The training aspects that scored the largest differences are: having enough equipment for you to practise your skills, the quality of the equipment provided for you to practise your skills and making methods of assessment clear. There are significant differences on each of the other aspects as well. The only aspect where the difference is least is in relation to the instructor's knowledge of the subject matter.

Table 5: **Comparison of student rating of CSWE IV online delivery course with overall national rating of VET training by 1999 TAFE graduates, rating out of 10**

Aspects of training rated	CSWE 1999 & 2000	National survey
Instructor's knowledge of subject content	8.9	8.2
The balance between instruction and practice	8.7	7.5
Making methods of assessment clear	9.1	7.7
The subject content reflects industry practice	8.6	7.6
The presentation of training material	8.6	7.5
The quality of the equipment provided for you to practise your skills	8.9	7.3
Having enough equipment for you to practise your skills	8.9	7.2
Access to learning resources	8.9	7.8
The convenience of both venue and class times	8.8	7.7
The usefulness of the training for your job prospects	8.7	7.7
The overall quality of the training you have received	8.8	7.9

Note: Not applicable, don't know and no response have been excluded.

Source: NCVER (2001)

One key outcome indicator used by NCVER is graduates' satisfaction with the overall quality of the course in which they qualified. In 1999, 67% of TAFE graduates nationally rated their course in terms of overall quality of the training received as eight or above (defined by NCVER as satisfied). As many as 83% of CSWE IV graduates and current students from the online delivery course rated the overall training quality of their course as eight or above. Nearly half of the CSWE respondents (46%) awarded it the highest score of ten or excellent.

Conclusion

The evidence presented above suggests that online delivery, as part of a mixed-delivery mode course design, is a more effective way of learning for English as a second language students compared with traditional teaching methods alone. On the issue of achieving a cost-effective outcome, this case study has shown that course level cost-efficiencies can be achieved if there is an organisational capacity to identify the new skills required to develop and deliver online learning and reallocate resources to new work roles. The use of a teacher's aide to perform a 'help desk' function for students while engaged in online learning was a key aspect of a more efficient use of resources. This released the course developer to take on other comparable duties, making better use of her high-level development skills. Other savings have been achieved through capitalising on the self-directed properties of online learning by eliminating the need for a support person for the time students are working in the independent learning centre. The resulting savings in wage costs are estimated to be a fifth of total wage costs.

AMES recognised that the skills of the initial internal innovator were extremely difficult to transfer to others. The innovator has been able to combine the new skills of how to formulate and deliver new learning tasks through online delivery with her knowledge of what works and what does not gained from face-to-face instruction. However, it is recognised that this combination of skills from two different learning contexts is rare. The ability to apply new-order skills to ingrained ways of working is difficult for most people. Where it is possible, it often requires that the innovator has a number of supporting resources that come together, often in a serendipitous way. From an organisational perspective, this pattern of innovation is not likely to be created by simply providing standardised training.

The case study suggests that the pattern of innovation diffusion has to be different from the process that initially developed the new forms of learning. The process of innovation diffusion requires, first, discerning the key skill sets or roles required by the new learning mode. The second step is to redesign work roles to make it easy and cost-effective to spread the new learning strategies throughout the organisation. The third step is to identify those skills that are the most difficult to replace or reproduce and those that are relatively easy to transfer. The fourth step is to set up a special position to retain and further foster the skills that are the most difficult to reproduce. The fifth step is to identify and define the new work roles involving the more easily transferable skills. The sixth step is to select people for those work roles whose acquired skills match those required. However, this is also likely to involve providing opportunities for the new work role incumbents to learn on the job through mentoring with the initial innovator.

The second aspect of the AMES case study at an organisation-wide level that needs highlighting is the provision of 'state of the art' resources to assist online learning through a variety of media in the Virtual Independent Learning Centre. The Commonwealth Government has partly funded the cost of developing this resource on the basis that this is a unique resource with potentially nationwide benefits that go far beyond the benefits that are accruing to AMES. Nevertheless, recurring costs need to be met and the vehicle for doing this is to build up a national and international subscriber base.

AMES Victoria operates in a competitive market of English language training providers. However, it has built on its strong reputation based on 50 years of service delivery to forge partnerships with other providers and to take a leading role in the market. The success of AMES Victoria has helped to engender a climate of innovation. This environment has made it easier for internal innovators to develop and implement new ways of learning based in the new technology. A key lesson of this case study is that new technology alone does not produce cost-effective outcomes. Success depends on the organisation making a careful assessment of the new skills required and an organisational climate that encourages the adoption of new work roles.

The cost-effectiveness of Adult and Community Education network-based online learning

Richard Curtain and Clare Hourigan

Overview

ACENET is a newly created, loose network of small, low-cost adult and community education training providers that have come together to use online delivery to enhance the attractiveness of their courses. ACENET, therefore, operates independently of a large institution and benefits from being free of the constraints that institutions geared to traditional teaching modes may impose. However, the down side is the lack of access to infrastructure and other resources that established institutions can offer. ACENET, according to an independent evaluation, has, over its short life, been successful in establishing effective network partnerships, implementing strong network management and making innovative and effective use of technology (I & J Management Services 2000, p.16.)

Two online courses form the basis of this case study. The first course described uses a mixed-mode-delivery format to teach language skills to mostly non-English-speaking women migrants with poor to intermediate level literacy and computer skills. How cost-effective is a mixed-delivery mode course for a client group that present particular challenges? The data presented on both the costs and student perceptions of effectiveness provide the basis for assessing the value of using these new methods for a student group with several learning disadvantages. The second course analysed in the case study is the support course for ACE teachers teaching online delivery methods and which is delivered in an entirely online delivery mode.

Detailed information on costs in absolute terms is available because of the project-based nature of the funding used to establish the network. The availability of costs data makes it possible to distinguish between fixed and variable costs in deriving a cost per student estimate. These data suggest that provided effectiveness ratings can be maintained, there may be scope to lower costs by increasing the number of students per current resources deployed.

In terms of effectiveness, both courses have been successful in developing a learner-centred focus. The result for the disadvantaged migrants has been an increase in their self-esteem, confidence, motivation, social skills, and, hence self-perceived employability. The ACE teachers have benefitted from acquiring not only new skills but also a new perspective on how to deliver effective learning.

Background

ACENET is best viewed as a network within a network. The wider network consists of adult community education (ACE) learning centres and neighbourhood houses usually run by locally elected committees of management. ACE learning centres offer courses ranging from business and technical skills, literacy and English language courses, to courses that prepare participants for entry to higher education. Also provided are general adult education courses such as personal growth classes like assertiveness and yoga, and cultural classes like languages and art. The adult and community sector is funded by the public purse to provide opportunities to people who otherwise would be unable to participate in education and training.

ACENET is a loose network of 11 adult and community education providers located in the western suburbs of Melbourne and the Victorian regional city of Ballarat. It has been described as 'an alliance of community organisations with a small unaligned co-ordinating hub' (I & J Management Services 2000, p.10). The members of the network have come together out of a common interest in learning through the use of online. Their specific focus is on English as a second language courses, adult literacy, and courses for the disabled. The extent of their overall activity in terms of students enrolled, contact hours delivered, and the number of units and teachers involved is shown in table 6.

Table 6: ACENET enrolments 1999

Learning network	Students enrolled	Student contact hours	Units trialled	Teachers delivering
ACENET	269	4435	26	29

Source: I & J Management Services (2000, p.12)

ACENET is one of ten learning networks established in 1998 by the Victorian Government's Office of Post Compulsory Education, Training and Employment to trial flexible delivery arrangements. A key objective of the learning networks is to help improve access to vocational education and training for community groups, the rurally isolated, and people with special needs. These learning networks were established across metropolitan and regional Victoria, bringing together a mix of TAFE institutes, community providers, and industry/enterprise partners. The main delivery platform, where appropriate, was specified to be the TAFE Virtual Campus (TAFE VC) as the vehicle for accessing learning tasks and to engage in communication activities, such as a web board and chat rooms.[4]

An independent evaluation of the learning networks offered the following assessment about ACENET:

> *ACENET was one of the most successful networks. It drew together a large network of community providers … in an inclusive partnership arrangement. It was guided by a non-aligned Network management team that was encouraging but firm, and demonstrated good project, partner, client and business management skills. Partners were supported in their initial development through modules such as ACE Teachers Online, and encouraged to develop, trial and then share learning resources.*
>
> *It handled the challenges of low literacy and ESL students well and was creative in the use of different forms of communications technology. Student and teacher feedback was generally very positive. Building on its internal strength, ACENET was able to develop cooperative relationships with competitors in the form of other Learning Networks. ACENET's initial optimism about the future for online delivery in the sector has been tempered by more realistic timing but remains justifiably strong.* (I & J Management Services 2000, p.17)

The following assesses the cost-effectiveness of two courses run within ACENET. The first course used a mixed-delivery mode to teach English to migrants with low-level language skills. The second course relied entirely on online delivery and was aimed at providing teachers with the skills to work with various aspects of internet-based software to access information and to communicate.

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[4] The TAFE VC is an education delivery platform for online courses offered by Victorian TAFE and ACE providers. Courses include hospitality, construction, automotive, engineering, personal care, small business, information technology, animal care, and recreation. Many of the courses are accredited. A range of tools is available for teachers to create and manage their learning environment. These include communications, unit/module management, student management and tracking, and online assessment (see http://www.tafevc.com.au/).

ESL Environment course at Werribee Community Centre

The Werribee Community Centre offers a range of courses covering adult literacy and migrant English classes and a variety of user-pays courses. The centre has also conducted employment training programs and vocational skills programs. It also provides facilities for support groups for intellectually disabled adults, visual and performing arts, childcare, play and activity groups (http://home.vicnet.net.au/~wbeecc/).

The Centre employs five English as a second language (ESL) and literacy teachers, an adult education co-ordinator, and a community services co-ordinator as well as general administration support. Volunteers, with occasional student placements, undertake much of the everyday office work at the centre. As a non-profit organisation, the centre accesses funds through community grants, sponsorship and fund-raising activities. A team of up to ten community members works voluntarily on the committee of management. The Werribee Community Centre has two computer rooms with 11 networked Pentium computers in each. These computers are used for both the online ESL courses as well as the standard computer courses.

It costs the students $10 to participate in the course and they receive a certificate at the end of the course. However, if they have not completed the requirements by the end of the term they are free to continue the following term. There are also computer courses run by six sessional tutors. A number of these courses are funded through Skillsnet while some courses are run on a user pays principle. Other sessional tutors are employed to run user pays courses on office administration and an accounting package (MYOB).

Nature of the course

The ESL Environment unit was tailored to meet the needs of students with intermediate English language skills. Several of the eleven students enrolled in 2000 had never used computers before and all had no previous experience with the internet or email. There was a suggestion that trying to teach English and computer skills at the same time might create a double burden for the students. This has, in fact, not been the case as students self-select to undertake the courses with an online component. The student demand for the online courses has been strong despite the availability of alternatives.

High level of interactivity

The ESL Environment course in 2000 involved two classes per week of three hours' duration each. The delivery method was face-to-face but in a computer lab with most of the work being conducted via the internet. The course also provided considerable opportunity to extend what was learnt in class. Students were able to work in pairs on activities such as putting together surveys, and are encouraged to use the internet to research various topics.

The course relied on extensive interaction with web-based learning tasks and required students to engage in considerable independent learning. The students spent their class time logged onto TAFE VC which provides them with a series of seven different topics related to the environment. The students were able to work at their own pace so that while some students are working on topic seven others may still be on topic three. MOO (multi user object orientated domains—a virtual chat program) was used because the chat facilities at TAFEVC could not always be accessed due to technical problems. Other forms of communication included posting reflections about topics on a web board. Other student activities included answering multiple-choice questions or completing short answer questions. The students are allowed to work on these activities using a range of media. Some of the students chose to use word processing packages and to save their work onto disk, while others emailed their work to the instructor. Others printed out a hardcopy of the activity and handwrote the responses.

In addition to the time spent in class, the students were able to access the computer room at other times during the week, if they chose to, to complete work that was not finished in class time. Some students also had internet access at home and so were able to complete work from there. Other students completed their assignments by accessing the internet from the local library. This greater variety of access points to the instructor illustrates the flexibility offered by using online facilities in the course. The result was a higher level of participation in the course as students who were unable to attend classes for personal reasons could still keep up with their course work requirements.

The flexibility with which the students could pace themselves through online delivery was seen by the students toward the end of their course as a major advantage. However, at first, the students needed a high level of support in dealing with the internet, such as assistance with entering URLs and in coping with malfunctioning computer hardware. External web pages also proved particularly difficult for the students to use as 'the language wasn't so friendly and it was sometimes tricky to know how/where to start'.

The need for support was partly dealt with by pairing the stronger students with the new and less confident students. This worked quite well as the collective experience of learning online 'together' helped them to work as teams in a way not usually possible in the traditional classroom. As the students participating in the Online ESL course had relatively low levels of English, they required a greater level of teacher assistance. As a result, students, in many cases, worked at a similar pace although there was some scope for self-paced learning.

The main instructor believed that online learning had changed her role from being that of a 'teacher', traditionally understood, to a role best described as that of a facilitator. As the students have access to all the information they need online, the role of the instructor is to provide guidance and support. The new approach requires online content of a high standard. The new role of guide does not mean that technology takes the place of the teacher. In her view, online delivery is better understood as an enhancement to the traditional teaching methods rather than something totally separate from it: 'technology has to be seen just as the tool that you are using to do the teaching, to make the teaching successful'.

The main instructor spent 20 hours per week teaching both traditional and online delivery courses. However, this did not include the time spent responding to emails from students and correcting their work. While some online teachers have found that responding to emails from students has been particularly time-consuming, this did not apply in this case. The continued importance of face-to-face meeting meant that students were more likely to ask questions during this time rather than use email. Online delivery was initially more time-consuming in having to correct students' work on the computer. However, with time and greater familiarity with this method of correction, the time difference between the traditional online delivery modes has disappeared.

The following section discusses the costs associated with the course in terms of establishment and recurrent costs.

Costs

In terms of establishment costs, the hardware infrastructure for the Werribee Community Centre was already covered with two computer rooms with 11 networked Pentium computers in each. These computers are used for both the standard computer courses as well as the online ESL courses. It has not been necessary to upgrade the computer hardware to provide online courses. The chairperson of the committee owns a computer business and is the person who is contacted when computer problems arise or equipment needs upgrading.

In terms of development costs, a considerable amount of instructor time was required to convert existing courses to an online format, as the learning materials for the course are required to be accessible for all users within ACENET. This development work required a considerable upfront investment of time compared to traditional teaching methods where the teacher can prepare learning materials immediately before each class. Extra time was also needed to prepare material for general distribution as the online ESL courses are up on the internet for all to access. However, time was saved later as once the learning tasks are put together and posted on the web, there is little further work required during class time.

One significant recurrent cost saving from online learning in access to online resources for small community centres such as Werribee as the amount of photocopying is cut down drastically. Photocopying is a major expense to the Centre because ACE students are not expected to purchase textbooks. While there are still printing costs involved when the students print out their work from the internet, this also can be reduced as more students develop the practice of saving learning activities directly onto a disk and working straight from this disk.

The online courses at the Werribee Community Centre are inexpensive for students. Students only have to pay $10 and are provided with computer and internet access, free printing of work and use of computer disks. The price of internet access time from the community centre is normally $2.50 an hour. However, only two students claimed that they had incurred additional expenses for internet use because of the course. These students are likely to have accessed the course material from their home computer. One student claimed less than $10 and the other between $10 and $19 for internet connection phone calls and the cost of an internet service provider. One student claimed less $10 for the cost of printing.

The cost of professional development is a recurrent expense associated with online delivery. This has been built into ACENET as a major element required in both the initial and expansion stages. The need for ongoing technical back-up is another recurrent expense that was noted. This is a role that teachers have not been trained to provide. Many teachers are unfamiliar with the technology used for online delivery and so will need a greater level of support in this regard. While the chairperson of the Werribee Community Centre offers IT support it is not a 24-hour service and so there are times when extra support is needed. Table 7 presents estimates of the additional recurrent costs as identified by the centre's full-time administrator.

Table 7: Estimated additional recurrent costs associated with the delivery of online courses at Werribee Community Centre, by %

Additional recurrent costs	%
Training teaching staff	50
Training management	50
Training web writers	100
Maintenance of technological equipment	20
IT support for staff and students (e.g. help desk)	20
Internet connections	100
Telephone calls	10
Insurance	15

Source: Administrator, Werribee Community Centre

Estimated costs based on initial project proposal

The ACENET co-ordinator has estimated the additional costs for the delivery of a mixed mode online course through ACENET (see table 8). These estimated costs were developed for the original project proposal and are presented because they offer some insight into the costs involved rather than mere assessments of how the costs may differ from traditional delivery methods.

These data on estimated costs suggest that an online mixed mode course is likely to be 200% more expensive than a traditionally delivered course. The significant additional cost is the payment to the instructor of $250 per student to cover the time involved (five extra hours per student) in the intensive nature of online work, performing a help desk function and the extra time required for preparation and follow-up. For 15 students, this amounts to two hours contact per student in addition to the usual two hours per week lecture-style presentation. This is in addition to five hours per week costed for the instructor to present the course (two hours presentation and three hours preparation).

The purpose of the additional time spent in online delivery (five extra hours per student) is to respond to the individual needs of students. This may be necessary in the initial experimental stages of setting up an online course *ab initio*. However, once the process is in place, changes to work processes can be made to improve cost-efficiencies. There are several ways costs could be reduced. The first is to reduce the time required by the use of expensive resources such as the instructor.

Table 8: Estimated costs of converting and delivering a mixed delivery mode online course

Course element	Amount of cost incurred	Existing traditional course	Additional costs for online delivery	Total costs
Fixed cost: pre-course preparation to convert to online	15 hours prep @ $50 per hour		$750	**$750**
Variable cost: admin costs associated with enrolment	15 students @ $33.3 per student	$500		**$500**
Fixed cost: instructor cost during course	5 hours @ $50 per hour tutor rate x 10 weeks	$2500		**$2500**
Variable cost: additional payment to instructor to reflect intensive nature of course	15 students @ $250 per student		$3750	**$3750**
Fixed cost: internet access	$1000–$2000		$1500	**$1500**
Total		**$3000**	**$6000**	**$9000**
Cost per student		$200	$400	**$600**
Marginal cost per extra student (excluding fixed costs)		$33	$250	**$283**

Source: Cost information, Dale Pobega, ACENET co-ordinator

One way to do this is to allocate the help-desk function to a lower-cost resource person. The second is to reduce the time that instructors spend on answering individual queries related to the subject matter of the course. This could involve developing a listing of frequently asked questions backed by the use by an instructor of a relational database to provide quicker answers to previously asked questions. Thus, improvements to the instructor's work process are likely to reduce costs significantly. The cost of the internet is also likely to reduce over time.

Changes to both these cost components will bring the costs closer to traditional forms of delivery. At present, the marginal cost of taking on an extra student for the online course, once fixed costs are covered, is high at $283 per student. If the variable costs of supporting a student could be halved and with more students in the course due to the greater effectiveness of learning (say 25 students), overall costs would only amount to $255 per student, a figure much closer to the cost of the traditional delivery method of $200. The marginal cost of taking on an extra student for an online course would be $125 compared to $33 for the face-to-face student based on 15 students.

Effectiveness of ESL Environment course

Of all of he online courses offered, no one has left because of dissatisfaction with the unit. Two students left the ESL Environment unit and one left the 1999 Bookclub unit to take up employment, while another two left the 1999 Bookclub unit because they returned to their home countries. These completion rates are higher than the completion rates of the traditionally delivered ESL units. The instructor also believes that the work rate (proportion of assignments completed) is much better in online units compared to the work rate of traditionally taught units.

Ten of the 11 ESL environment course participants responded to an invitation to complete a questionnaire on their perceptions of the effectiveness of the course. The participants in the ESL Environment course in 2000 were all women, 90% of whom were aged 25 years and over. Half of the participants said that they had completed Year 12. For most (60%), it was the first time they had taken part in a course delivered online. Most (80%) said that they spent between five and ten hours a week on the course. All students responded in the affirmative to the question 'Would you like to do more courses or modules that are delivered online in the future?' All of the online aspects of the course were valued highly (between 70 and 100%): learning content, chatting in groups, and one-to-one email. Only online assessment received a lower rating.

Most students (80%) were not competent computer users before the course. Similarly, 90% did not know how to use the internet competently. This means that improved ability to use computers and the internet can be directly attributed to the course. Some 90% of students agreed (60% agreeing strongly) that 'this course has increased my ability to use computers'. All respondents agreed (with 90% agreeing strongly) that 'this course has increased my ability to use the internet'.

In response to the statement that 'online delivery helps me learn more relevant information than if this course was delivered traditionally', 90% agreed. In relation to the statement that 'online delivery helps me understand information quicker than if this course was delivered traditionally', 80% agreed (with 60% agreeing strongly). However, in response to the statement that 'online delivery helps me gain a better understanding of course material than if it was delivered traditionally', only 60% agreed and 40% gave a neutral response (neither agreeing or disagreeing).

These differences in responses suggest that online delivery offers certain benefits to the learner such as more relevant information with quicker access to that information. However, it appears that 'better understanding' is a benefit not necessarily inherent in online delivery. Presentation and support from teachers are likely to be crucial ingredients as well. Nevertheless, at the margin, the use of technology increased the students' motivation to work (80% agreed, with 40% agreeing strongly). The online nature of the course was seen as a key factor in making it easier to complete the course (all agreed with 90% agreeing strongly).

Most agreed that the benefits from online delivery included easier and more confident communication with the teacher, and faster feedback on submitted work. Other benefits included easier and more confident ways to communicate with other students, and ways to link up with others outside the classroom. The other benefits students gained from the mixed-delivery-mode course were: an improvement in ability to express oneself in writing (90% agreed, 60% strongly agreed); greater capacity to explain concepts when writing (60% agreed, 30% agreed strongly); enhanced ability to organise oneself (90% agreed, 30% strongly); and capacity to complete assessment tasks on time (70%, 10% agreed strongly).

Another perceived benefit was the time saved. Some 90% disagreed with the statement that 'on average I spent more time doing this course than if it had been delivered traditionally'. Flexibility in the use of time was also seen as beneficial: 'Flexibility in the time spent working on this course helped me to learn better' (all agreed, 90% agreed strongly) and 'I was able to do my learning when it suited me' (all agreed strongly). Finally, students were asked for their response to the statement: 'I am achieving at the level of my expectations'. While 90% agreed, only 30% agreed strongly. Again, this suggests that online delivery helps improve learning capacities, even for people with a relatively low level of English language skills. However, the challenge presented by the variety of resources available may have been a little daunting for some.

Students were also asked to rate aspects of their training using items from the NCVER student outcomes survey. The latter is a national survey of students who undertook vocational education and training (VET) at a TAFE institute in Australia. Students were asked to rate the nominated aspects of training using a ten-point scale with following categorisation of the benchmarks. Table 9 compares the ratings given by the ACE ESL Environment students (N = 10) with the ratings given by students nationally who completed their course during 1999 and graduated with a qualification from a course (N = 41 600).

Table 9: Comparison of student rating of ACE ESL Environment mixed delivery mode course with overall national rating of VET training by 1999 TAFE graduates, by %

Aspects of training rated	ESL Environment	National survey
Instructors' knowledge of subject content	9.7	8.2
The balance between instruction and practice	8.9	7.5
Making methods of assessment clear	8.3	7.7
The presentation of training material	8.9	7.5
The quality of the equipment provided for you to practise your skills	9.2	7.3
Having enough equipment for you to practise your skills	9.6	7.2
Access to learning resources	9.6	7.8
The convenience of both venue and class times	9.7	7.7
The usefulness of the training for your job prospects	8.7	7.7
The overall quality of the training you have received	9.8	7.9

Note: Not applicable, don't know and no response have been excluded.

Source: NCVER (2001)

A comparison of each of the specific training aspects rated by both populations in table 9 indicates that the ESL Environment course outscores the national average on each training aspect rated. The results show that the ESL Environment course using online delivery methods scores better than the ratings given for graduates for all TAFE courses. The training aspects that were rated more highly by the ACE students were: having enough equipment for you to practise your skills, the convenience of both venue and class times, the quality of the equipment provided to practise skills and access to learning resources. There are significant differences on each of the other aspects as well. The only aspect where the difference is least is in relation to making methods of assessment clear.

An overall indicator used by the NCVER is graduate satisfaction with the overall quality of their course. In 1999, 67% of TAFE graduates nationally rated their course in terms of overall quality of the training received as eight or above (defined by NCVER as satisfied). All ESL Environment students (100%) rated the overall training quality of their course as eight or above. Eighty per cent of the students gave the overall quality of training the highest score of ten or excellent.

These high-effectiveness scores, both in terms of completion rates and satisfaction ratings, suggest that there is considerable scope to increase the number of students without affecting the quality of the training received.

Online ACE teachers' course

The online ACE teachers' course, which takes place almost entirely online except for assessment, is designed to introduce ACE teachers to online delivery and to 'become constructive and critical users of online technology'.

Box 1: Description of Online.ACE teachers' course

Online.ACE 2000 is a professional development program for ACE personnel to explore, acquire and use skills and approaches to online course development and facilitation through the TAFE Virtual Campus. The course is delivered on the Victorian TAFE Virtual Campus for the ACENET Flexible Learning Network.

Online.ACE 2000:

- uses a range of net media (www, email, MOO text-based virtual realities, IRC, java-based chat, web-based delivery platforms)
- aims to introduce adult community education & TAFE practitioners to new learning technologies and pedagogical approaches
- is relevant to teachers working with learners across the spectrum—from Adult Literacy and ESL learners to VET and tertiary level students
- provides practitioners with an introduction to online course design and delivery using WebCT (platform of choice for TAFE VC Victoria and TAFE South Australia)
- models online facilitation skills across a range of synchronous online media and provides practitioners with a sound basis for further professional development in the area of online course delivery

Source: Pobega & Russell (2000)

The first five weeks of the course is spent exploring and discussing the use of online technologies and the ways in which those tools and environments might be useful or otherwise within participants' actual work environments and classrooms. The participants are then introduced to the TAFE VC, where they explore the features of the platform to compare it against other net technologies and environments. These features include the use of TAFE VC CHAT as a synchronous conferencing medium, the use of asynchronous webboard and the use of student/teacher desktop for communication via lessons and assessment tasks (Pobega 1999).

Twenty-seven teachers have enrolled in the course over two years (11 for the 1999 course and 16 for the 2000 course). The technologies used in the course are a mixture of print-based text, online conferencing sessions via MOO, an email list, the World Wide Web, and TAFE VC. While most of the learning activities are print-based, discussion is conducted online via MOO. An email list is also used to enable course participants to reflect further on the topics covered.

The course was advertised[1] as requiring one hour online, starting at 10 pm on a Thursday evening. However, in practice, at least three hours were required per week. This consisted of one hour of preparation, one hour online and one hour of post-conferencing work (email follow-up, further administration, programming, further course adjustment and fine tuning). This meant that for every one-hour synchronous session delivered, two hours of preparation and follow-up are needed (Pobega 1999, p.2). According to the survey responses, the time commitment per week for many participants was more than the three hours. The survey responses from the course participants (see below) showed that while 42% spent 5 hours or less on the course a week, 35% spent between 5 and 10 hours and 12% said that they spent between 10 and 15 hours per week working on the course.

Costs

Establishment costs in terms of infrastructure are borne by the course co-ordinator and the students because they are participating from their homes. One course participant claimed an additional cost of between $1000 and $1500 for the purchase of a computer. The developments costs were incurred in the preparation of material, which was carried out over a 15-week period. Table 10 identifies the costs of the development stage, which includes both the preparation, and the training of four teachers who would help during the actual running of the course.

Stage 3 of the online ACE teachers' course refers to the actual course delivery. The course ran for 10 weeks and was taught by the two project officers and the four teachers who were trained in stage 2. As this is a professional development course, course participants were paid for their time of two hours per week. Course participants were expected to put in a total of five hours per week, and so it was left to their employers to top up the extra three hours of study time with their own professional development funds.

Table 10: Costs involved in stages 1 & 2: development stage of online ACE teachers' course, 2000

Item	Hours	Cost per hour	Total cost
Course development	48 hours	$50.00	**$2400**
Tutor training delivered by project officers	88 hours x 2	$50.00	**$8800**
Tutors' timing for training (teachers)	40 hours x 4	$17.50	**$2800**

Source: Dale Pobega (2000)

Apart from the costs listed above, $4000 was also provided for basic administrative costs such as mail-outs and the purchase of the *Online ACE sharing good practice* book for the student/ teachers and costs involved in the competing the enrolment process. The administration involved in course set-up was time-consuming and costly. The time-consuming aspects related to enrolment process via TAFE VC, communications with participants pre course (mailing list set up), photocopying of course text, and mailing of book/hardcopy materials. These costings may not therefore accurately reflect the actual resource costs involved in stage 3. In addition, $600 was also provided to cover the cost of travel for the course developers to participate in face-to-face meetings. The total funding for the online ACE teachers' course came to $40 100.

Table 11: Costs involved in the delivery stage of online ACE teachers' course, 2000

Item	Hours per week	Cost per hour	Total cost
Admin costs			**$4 000**
Course presenters (2 project officers)	88 hours x 2	$50.00	**$8 800**
Tutors	40 hours x 4	$35.00	**$5 600**
Payment for course participants	20 hours x 22	$17.50	**$7 700**
Total cost to deliver course			**$26 100**

Source: Dale Pobega (2000)

Table 12: Comparison of the costs of delivering a course entirely on online with a face-to-face mode

	Non online	Entirely online
Course development	$2 400	$2 400
Project officers providing pre-course tutor training		$8 800
Tutors' time while in training		$2 800
Admin costs	$4 000	$4 000
Course presenters (2 project officers)	$4 400	$8 800
Tutors' time during course		$5 600
Payment for course participants	$7 700	$7 700
Total	**$18 500**	**$40 100**

Source: Dale Probega (2000)

The comparison in table 12 suggests that a course developed for and delivered entirely online is just over double the cost of a course delivered face-to-face. The additional costs are incurred for online delivery by the pre-course training of additional support tutors and having two project officers and four supporting tutors involved in the delivery of the course rather than using only one instructor in a traditional delivery setting within no supporting personnel.

Effectiveness of Online.ACE teachers' course

Students from both the 1999 and 2000 Online.ACE teachers' course were asked to offer their assessment of the effectiveness and flexibility of the course. A high response rate was achieved (26 out of 27 course participants). In contrast to the ESL Environment students, three-quarters of the teacher participants said that they knew how to use a computer well before they started the course and 80% knew how to use the internet well. Most respondents were women (77%) and virtually all were aged 25 years and over, with 46% aged 45 years and over. For all but one participant, the Online.ACE teachers' course was the first time they had taken part in a course delivered entirely online.

In response to the question: 'How valuable were the online or non face-to-face means of contact in helping you to learn?', as many as 92% rated online delivery as valuable, with 42% of course participants rating it as very valuable. Participants were asked to rate on a five-point scale 'which aspect [of the course delivery] was most valuable for you in helping you to learn'. Participating in chat groups received the highest rating (89% saying that they valued this aspect of the course, with 58% rating the course highly in this regard).

In terms of the perceived effectiveness of different aspects of the course, the responses were more variable. The highest rating was given for the statement: 'I would take another course that was delivered online' which suggests that most participants placed a high value on the method of delivery. The technology was also rated highly for increasing motivation and making the course easy to complete (61 and 65% agreed respectively). Also important to the course participants was being 'able to do my learning when it suited me' with 81% agreeing to this statement. Being able to work from home was also seen as an important benefit of the course ('I like not having to go to a campus for classes' attracted a 77% agreement with the statement).

However, several aspects of online delivery did not attract a strong a set of responses. Only 27% of respondents agreed with the statement that 'online delivery gives me a better understanding of course material than if it was delivered traditionally'. Similarly the same proportion agreed with the statement 'online delivery helps me understand information quicker than if this course was delivered traditionally only'. Only 38% agreed that the online delivery method gave them better access to more relevant information than through a traditional delivery mode.

The course participants were also asked to rate aspects of their training using items from the NCVER student outcomes survey. The latter is a national survey of students who undertook vocational education and training at a TAFE institute in Australia. Respondents were asked to rate the nominated aspects of training using a ten-point scale.

Table 13 compares the ratings given by the Online.ACE respondents (N = 26) with the ratings given by students nationally who completed their course during 1999 and graduated with a qualification from a course (N = 41 600). Training aspects that were not relevant have been omitted. For four out of the six training aspects compared, the Online.ACE course scored better than the average ratings given by 1999 TAFE graduates. The aspects of training where the Online.ACE course scored higher ratings are: instructor's knowledge of subject content, the usefulness of the training for your job prospects and the convenience of both venue and class times. The aspects where the rating the ACE course was slightly lower than the national average were the presentation of training material and the balance between instruction and practice.

One key outcome indicator used by NCVER is graduates' satisfaction with the overall quality of the course in which they qualified. In 1999, TAFE graduates nationally rated their course in terms of overall quality of the training at 7.9. This compares with a rating of 8.0 for the Online.ACE course participants. If might be expected that teachers as students might be more critical of their course compared with recent TAFE graduates.

A rating by the teacher participants of the overall quality of the training is on a par with the rating given by a national sample of TAFE graduates. However, the equivalent reference point should be a distance education course delivered traditionally. As it is known that the latter score low levels of student satisfaction, the achievement of a comparable rating to classroom-based instruction is significant. It indicates that the online course has overcome the disadvantage traditionally experienced by arm's-length teaching to achieve a similar rating to face-to-face teaching.

So despite being potentially a more critical consumer, the satisfaction ratings suggest that the online course stands up well as an effective means of imparting new skills to busy, experienced teachers. The level of support available and the high degree of interactivity in the course help to explain the high satisfaction ratings given by a critical group of consumers.

Table 13: Comparison of Online.ACE teachers' course participant rating of their online delivery course with overall national rating of VET training by 1999 TAFE graduates, by %

Aspect of training rated	National	ACE
Instructors' knowledge of subject content	8.2	9.4
The balance between instruction and practice	7.5	7.2
The subject content reflects industry practice	7.6	8.3
The presentation of training material	7.5	6.0
The convenience of both venue and class times	7.7	8.5
The usefulness of the training for your job prospects	7.7	8.5
The overall quality of the training you have received	7.9	8.0

Note: Not applicable, don't know and no response have been excluded.

Source: NCVER (2001)

Conclusion

This case study illustrates the experimental phase of using new technology to extend the scope and to improve the effectiveness of a network of community-based education and training providers. The data on the costs of setting up and delivering two types of online courses—mixed mode in a classroom setting and entirely online—show that there is a number of additional expenses involved compared to the traditional classroom delivery mode.

The project-based nature of the funding used to set up the network has helped to highlight the 'hidden' costs that may not be made explicit in an established educational institution. These costs include the recurrent costs of training educators, payments to internet service providers; the additional cost of technical support; as well as the set-up costs of converting existing material to an online format. The costs information highlights the importance of an investment in the training of personnel backed by appropriate levels of support to enable the new technology to achieve its potential.

The online courses examined have produced highly effective outcomes, judged in terms of completion rates and student satisfaction levels. These high-effectiveness ratings are not surprising, as both courses have emphasised a high degree of interactivity through the use of Internet-based communications tools. However, once the courses are 'bedded down', it should be possible to reduce costs by using several means to do this.

One way is to improve the work processes so less time needs to be spent on expensive resources in the provision of one-to-one responses to queries. This could involve separating the help desk function from the role of 'e-moderator' and allocating it to a service provider with lower costs. It could also be achieved by making it easier for students to answer subject-specific questions by referring to a listing of commonly asked questions. Instructors could also build up their own bank of previously answered queries through the use of a relational database. Another means of reducing costs, once procedures are in place, is to increase the number of students.

The case study does show that online learning achieves its high level of effectiveness though being student centred. This is achieved by more active learner involvement compared with the 'chalk-and-talk' mode of delivery, quick response times to queries, a better focus on individual needs and a more intellectually engaging form of presentation. These elements of increased interactivity, however, come at a price. The challenge is work out ways to achieve a better balance between costs of inputs and maintaining effective learning outcomes.

Horses for courses: The cost-effectiveness of online Anatomy and Physiology modules

Reece Lamshed

Overview

Flexible learning strategies delivered through online technology can be applied in a number of ways. A feature of this case study is an analysis of the cost-effectiveness of two different types of online delivery within the same course—some students undertake the course entirely online as distance education mode while others undertake it as internal students in a computer lab.

The case study also offers an opportunity to identify the type of learning that is better suited to online delivery and the conditions that are likely to improve its effectiveness. Online delivery, on the one hand, offers considerable benefits to students in terms of easier access to learning opportunities and a greater level of engagement compared to traditionally delivered courses. It also offers teachers benefits in terms of flexibility and efficiency gains. However, there are also downsides that can flow from use of the new technology. These need to recognised and addressed to achieve outcomes that can justify the investment of time and money in the application of internet-based technologies.

A major benefit to students of the online format of the Anatomy and Physiology modules is much greater control of their own learning. They are able to achieve this through self-paced use of the flexible learning materials. A particular feature of the course under study appreciated by students is the availability of automatic quizzes and electronic tests that provide instant feedback on their progress. The benefit for teachers is freedom from the preparation of learning materials and some classroom instruction. The electronic quizzes and tests also free the teacher from having to set up tests and to correct them. These aspects of online delivery provide significant cost-efficiencies.

However, assessing cost-effectiveness requires more than consideration of inputs and outputs. Effectiveness can only be judged by looking at how well learning outcomes are achieved. This, in turn, requires understanding the expectations of students about the outcome they are seeking. Any assessment of effectiveness also requires taking into account the capacity of the training provider to deliver what is sought.

Background

Box Hill Institute of TAFE is a leader in Australia in the use of the internet in education and training. Encompassing six main campuses in the eastern suburbs of Melbourne, the Box Hill Institute of TAFE accommodates over 28 000 students from within Australia and overseas. The institute offers 35 online courses as part of over 160 full and part time courses—ranging from e-business to an introduction to psychology.

The development of the online format for the Anatomy and Physiology modules under study needs to be understood against the background of the institute's past track record of use of new technology. Box Hill was the first institute in Victoria to have a web presence (in 1995) and the first institute of TAFE in Australia to run a training course delivered via the World Wide Web (in 1997). Its interest in online delivery is a continuation of its longer-term work in computer-managed learning, which extends back as far as 1983. In this respect, the transition to internet or online learning was seen as a natural progression from computer-based training.

A significant milestone in Box Hill TAFE's engagement with online delivery was in 1991 with the development of a self-paced program supported by computer-managed learning for a technology management course as part of the Bachelor of Applied Science. This was a joint project with the State College of Victoria (now Deakin University). A computer-managed learning system (CML) produced in Canada was used to create the courseware and email was used as the communications tool between students and teachers. Box Hill TAFE also secured Commonwealth funds to provide the external students with a laptop to access the CML system. A second important milestone was in 1996, when Open Learning Services provided funds to develop and deliver a teaching and learning online course. This course, with modifications, is still delivered.

In the mid-1990s the institute committed to spend about $200 000 on the development of flexible delivery resources for Box Hill TAFE courses, and some of the funds were earmarked for online delivery. This, as in the case of the Centre for Animal and Biological Sciences, was a real incentive for the teaching departments to seriously investigate the online option. Part of this move to the online delivery was reflected in the change of the Computer Managed Learning Unit to an expanded role as the Centre for Online Services in 1997/98.

Nature of the course

Box Hill Institute of TAFE has been delivering the modules Anatomy and Physiology 1 and 2 since 1996. Both modules form part of the Certificate IV Animal Technology and Certificate IV Applied Sciences (Biological Sciences), which is often studied within the Diploma of Applied Sciences (Biological Sciences). The nominal duration for each module is 45 hours. The purpose of the first module is to provide concepts and principles related to the major anatomical structures at the macroscopic and microscopic levels. Module 2 builds on the concepts and principles established in module 1, and investigates specific systemic processes and mechanisms such as how an organism requires metabolising nutrients and excreting metabolic product to survive and reproduce.

Since its introduction, some 200 students have used the online resources—with between 45 and 55 enrolments into the two Anatomy and Physiology modules each year. Ten to fifteen teachers use the online teaching assessment resources. There are both external and internal students accessing the material. External students access it using the internet at home or at work, whereas internal students come onto the campus and work in a classroom and use computers to access the material via the Internet. There are presently six external students undertaking the module—approximately 10% of the total—and it is envisaged that this proportion will expand over time.

For the internal students, teachers offer a tutorial in combination with the online material as an option for internal students. Students (and trainers) can choose to use hard copy workbooks alone if they wish. However, in practice, in all cases they are used in combination with the online resource.

The online format

The relationship (and difference) between the workbook and the online resource is shown in the following extract (see box 2). This is taken from the first section of the online module. As indicated in this extract, students are required to read the relevant section in their workbooks as they work through the online material.

Box 2: Extract from online module

Structure and Function of Mammals

Before you do any work on this module, please send a brief message to your tutor using the mail icon above. Details of how to use this are given in the Introduction.

Send your tutor some information about yourself - your name, what course you are doing, what you hope to get out of this course and what your career aspirations are. (This only requires a few sentences).

To work through this part, do the following:

In the Anatomy and Physiology I module resource book, read the section on body structure and function.

Use the following links to look at histology slides of different types of tissues.

Epithelial tissue

Connective tissue

Smooth muscle tissue

Skeletal muscle tissue

After this, to test your understanding of this part, attempt the Self-Help activity, which is a quiz.

If you would like to look at more histology slides, use the link below to access the Loyola University of Chicago, Stritch School of Medicine site. This is not an activity you need to do, but you may find it interesting.

Loyola University of Chicago Site

The following site may also help you in this section:

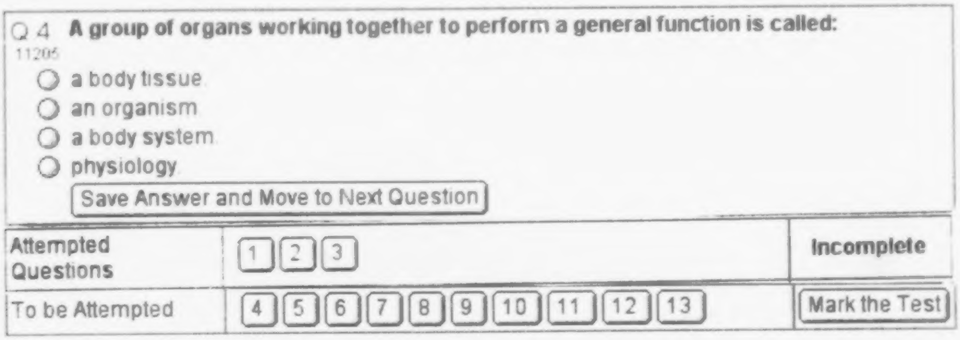
University of Minnesota - Cell Terminology and Biochemistry

University of Minnesota - General Histology

Your assessment for this unit includes an Assignment, details of which are in 1.2.

The online resource also provides additional features such as: email communication (the first exercise is where the student sends an email to their tutor), a number of online links to university resources, some coloured graphic references and a self-assessment tool or quiz. The self-assessment tool or quiz is shown in figure 1. Another feature of the online resource is an interactive calendar, where all the important dates and events can be inserted. Chat and discussion groups are also available through WebCT, but these have not been used in the delivery of Anatomy and Physiology 1 and 2.

Figure 1: Self-assessment tool



Q 4 **A group of organs working together to perform a general function is called:**

11205

○ a body tissue

○ an organism

○ a body system

○ physiology

Attempted Questions	1 2 3	Incomplete
To be Attempted	4 5 6 7 8 9 10 11 12 13	Mark the Test

A quiz is provided throughout of each section of the module. Students may undertake the quiz at any time. Access to the quiz is pass-coded for databank purposes. On completion of the quiz, a result is automatically calculated and provided instantly back to the student. A student can re-do a quiz up to five times, but then they will be locked out and asked to contact their instructor. A final test for each section of a module is provided electronically and in a hardcopy form. To ensure authenticity the scored tests are conducted under strict supervision, for both the external and internal students. External students are expected to find their own supervisor, and this is not a problem for employed students.

The role of the quiz

It is desirable for learning technologies to have a high level of interactivity, to engage and motivate the learner. As many online courses have found to their peril, simply recreating print-based material online is not a particularly effective teaching method: it is simply using the internet as a distribution service. The clever interactive device in the Anatomy and Physiology resource is the self-assessment form or quiz. In fact, the course content can be said to be built around the quizzes.

Throughout every section of a module (and each is divided up into five or six sections), the student can take a quiz to test their understanding. In Anatomy 1, there are seven quizzes spread across the module. The number of questions in each quiz ranges from 7 to 20, but these questions are randomly selected from a quiz bank in which there may be 300 or so questions.

The students have found this to be an effective learning tool. A survey of veterinary nursing students (many of whom are undertaking or have undertaken the modules under study) conducted recently by Monash University showed that the students enthusiastically used the quiz in their learning. Most used it as a way of studying for the formal test and to reinforce tutorial and module information. Some students have been observed while in class, working through the quiz prior to reading any of the content material as a way of finding out what they did not know, and then using this information to guide their study. The Monash survey also revealed that the quiz was viewed by students as more useful than talking to a tutor face-to-face, although not so useful as talking to other students in the class.

Having a high level of teacher–student and student–student online communication is another interactive feature that some online learning materials use as a motivational technique. Interestingly, in the study of the veterinary nursing students, internal students claimed that they hardly used email (they came into the class weekly anyway). They preferred overwhelmingly to submit a hard copy of their assignment (rather than attaching an electronic copy to their emails). The reasons given for this related to concerns about security and documents not being correctly delivered to the tutor. Few students also bothered to use other internet resources. Again, the internal student's online study is supplemented by classroom activities, so therefore the need to use internet resources is minimised.

Online delivery in-house

Students using the online resources are both on and off campus (internal and external students). They have very different approaches to using the resource material, and consequently, different teaching strategies are adopted for them. Internal students are on campus, usually undertaking a number of other modules as part of their certificate or diploma courses. They come to a classroom where there is generally one computer for each student. They login to the internet to access course content and work through the material at their own pace. As the Anatomy and Physiology is a 45-hour module, they do about three hours per week over an 18-week period.

The on-campus students spend about 50% of their time on a computer; the other 50% of the time is spent in tutorials, practicals and other classroom activities. Students work at their own pace, reading the material and completing the self-assessment tests. The instructor is there to assist with issues arising from the subject or with technology issues (accessing online material).

When they first join the course, most students have little computer experience. Therefore, the first sessions are dedicated to the use of the computer—particularly how to access the internet, and how to send an email. It's been observed that once the students are familiar with the use of the computer and the internet, they find using the online resource itself (WebCT) reasonably easy. The students enjoy the classes, can discuss issues directly with their instructors and other students, can socialise and so on. The motivation to attend, participate and complete each module is high as it is reinforced by the learning environment. The online component, because it is conducted in the classroom, is not all that different from traditional learning.

For the teachers, the online resource is like any other teaching technology or computer-based training system. The teacher is there to facilitate learning, and the courseware is designed to provide all information necessary for the student to complete the module. The trainers work a traditional set of hours. The class times are set in the timetable. The class is effectively managed as a group. As students are in effect working at their own pace, the teacher can attend to those individuals who may be struggling with the courseware material.

Interestingly, the main issue for teachers teaching internal students is how to effectively integrate technology into the classroom structure. There is current discussion at Box Hill TAFE on the proposition to limit the number of computers in a classroom; for example, to five or six. (At present, every student has access to a computer.) The trainer often finds it difficult to attract students' attention when instructions are being provided. Students tend to become totally absorbed by what is on their computer screen, and tend ignore teacher instructions. Sometimes the teacher is not sure whether the student is following the courseware material or off looking at other internet sites.

Online delivery as distance education

Online delivery for students who are not able to attend classes at the institute involve a different set of learning issues from those of the internal students. External students are doing the course from a distance at home or at work. Working collaboratively with other students is known to be a high motivating factor in distance online learning. However, the external student is often isolated, and does not have the peer learning advantage that the internal student has. External students are given six months to complete each module. It is found that they usually take longer than this. Their motivation is sometimes lower, since they tend to worry about assessment and put off their tests. The non-completion rate for external students is higher than for internal students.

Normally, the external student choosing the online option will have access to a reasonably good computer and the internet. So, although the instruction on the use of technology is difficult, the issue is often avoided by self-selection: students who have a good grasp of technology choose the online option. If the external student's knowledge of how to use a computer is deficient, it is difficult for the institute to provide IT-support. The student needs to have the contact numbers and email addresses of the people who can help if there's a problem—technical, content and administrative. This will ease a lot of student anxiety.

Instructions for using the resource and information about the hardware/software requirements are provided in the introduction of the courseware material. Students are referred to the training provided by Netscape or Internet Explorer —'Using Internet'—if they want help with the functions of the internet. There is an expectation that external students opting for online delivery have reasonably high levels of computer literacy.

For teachers dealing with external students, the demands are higher than for classroom teaching. The work carried out by the external student is often sporadic. Work submitted seems to follow the ebb and flow of erratic study patterns. There may be no material sent for a few weeks, and then a flood of activity over a short time—perhaps over a weekend. However, teachers who take on these students find the challenge enjoyable. Flexible delivery teachers are usually a self-selected group and tend to highly organised and flexible individuals. Their challenge is to devise different ways of managing the students because the external student, in most cases, needs to be managed individually.

The teacher, in dealing with external students, has the flexibility of being able to respond to student emails at home in the evenings, or at the campus during office hours. If the content material is well-constructed, it minimises the need for a large stream of email. It was reported that in most cases for the Anatomy and Physiology modules, external students expected no more than a weekly email response from their instructor.

The centre has one teacher dedicated to managing the distance education students that now number over 100. Six external students do the modules online; the others do the modules using paper-based materials. It is likely that both these options will be open for students to choose for some time in the future. The online option for external students was begun in April 2000. In effect, the online external students are regarded as part of the same cohort as the distance education students.

Costs

Development and infrastructure

A team was organised to develop the online courseware. This included a content writer, an online expert, a programmer and a graphic artist. The content writer was from the Department of Animal and Biological Sciences, and the rest of the team were from the Centre for Online Services. The funds provided for a total of 400 staff hours for online resource development. The content was built into the learning delivery system, WebCT. Other systems were investigated at the time, including one developed by the institute. WebCT was selected because it suited the organisation of the content material and provided a student management structure that was necessary for the delivery of the courseware material. The online modules were trialled and then delivered in 1999 and 2000.

Writing the course material usually takes the bulk of the production time in developing online training materials. This is especially the case in subject areas where there is no standard textbook or learning materials already developed that utilised to develop the online courseware. In the case of the Anatomy and Physiology modules, the essential content information was provided in two workbooks. These had been written in a draft form in 1997. The online development team decided it was unnecessary to reproduce this content on the online resource. Instead, different content was written for the online courseware, adding value to the workbooks. In developing this material, it is estimated that the content writing took (including refining the hardcopy workbooks) took 0.4 days for 40 weeks; the information design took about 0.4 days over 40 weeks and programming, 0.2 days over 20 weeks. This totals about 400 hours.

The writer focussed on the information content (knowledge) of the subject, but also wrote the questions for the quiz and found suitable online links to external resource material. The information designer advised on how the material should be presented in the online resource, converted the text into HTML, constructed the student management system and integrated all the material into WebCT. The student management includes processing student names and passcodes into the system so that all the quizzes and assessment tasks are properly related to a particular student. The graphic designer created additional graphs and illustrations, where necessary. The programmer linked components of WebCT with a software system devised at Box Hill TAFE—the test assessment components of the module are not structured in WebCT, but in the Canadian CML.

An information designer was engaged to assist the content writer make the information compatible with the way online materials are structured, accessed and used. At the same time, the workbooks were re-drafted making them more compatible with the online courseware.

Capital costs

There is the issue of the cost of the technology that online delivery requires. The centre for Animal and Biological Sciences operates two computer centres. One is an integrated tutorial room, laboratory and practice clinic in which there are five quality computers all linked to the internet. The cost of purchase and maintenance is borne by the centre. The institute provides IT support. The second is a computer laboratory (with some tutorial space) consisting of 21 quality computers. In the first year of online delivery, the computer lab was full of few ancient computers, and students used the campus library. In March 2000, the new lab was opened with high-speed computers and links to the internet. This laboratory was built in co-operation with the institute library and is open to all students when not used by the Centre for Animal and Biological Sciences. The maintenance costs of the computer lab are shared and IT support provided by the institute.

Although the need for a computer lab to deliver the online courseware into the classroom is a major cost increase over traditional (non-computerised) classroom, the centre was able to reduce their proportion of establishment costs by negotiating a cross-campus technology arrangement. There will be costs associated with hardware and software upgrades, but the establishment costs can be spread over several years.

Recurrent costs

The Centre for Animal and Biological Sciences has not assessed the costs involved in online delivery. In fact, the costs of online delivery, either in relation to the internal students or the distance education students, are not budgeted separately. This is not surprising. The whole online delivery approach has evolved gradually out of the paper-based distance education and computer-based training experiences. The cost of external delivery has been documented, so it was natural to assume the online costs would be somewhere equivalent. In addition to this, the number of external students at this stage—six—does not constitute a sufficient base to make a detailed and separately itemised costing.

In addition to this, funding is not differentiated for online delivery but is based on a fee per student contact hour, irrespective of whether the course is provided online, externally or internally. Therefore, there is little incentive or auditing responsibility to itemise the online training delivery separately. Much of the funding initiative for online delivery—certainly at the materials production end—has been provided by grants either from the institute itself, or other government authorities—the Australian National Training Authority or the State training authority. While the cost of producing online courseware is well documented, the cost of online delivery is not.

The Centre for Animal and Biological Science manager is of the opinion that the economics of online delivery will become more apparent and more certain when the number of enrolled online students is significantly higher, and the program has been delivered for a longer time. However, as a consequence of the investigation for this report, there has been an effort to identify the cost centres and make some comparative judgement about whether the costs are higher or lower than traditional delivery methods.

Internal delivery

It is difficult to single out the internal online delivery from the non-online, because the online component now forms part of the traditional teaching practice. The student in the past would have consulted a textbook and sat in a classroom in front of a teacher and did practicals, laboratory experiments and assignments and was assessed on paper. The current student in Anatomy and Physiology is now in control of their learning, using flexible learning materials that they can use at their own pace. In particular, they work through the textbook (workbook) linked to a computer-based training system that provides automatic quizzes and electronic tests. The essential difference with traditional learning is two-fold: the provision of self-paced learning materials frees the teacher from preparation and some classroom instruction, and the electronic quizzes and tests free the teacher from assessment. These are the sources of significant time–cost savings.

Other costs for online delivery in the classroom are much the same as the traditional approach. The enrolment and student administration time is the same for internal students using online or offline delivery. The teacher has to be present in the class times allocated, respond to student inquiries, assess assignments etc. The following table shows the online cost centres and the estimated cost over and above non-online internally delivered Anatomy and Physiology modules.

Table 14: Estimated additional costs on internal online delivery compared with traditional delivery methods, by %

Item	Cost	Comment
Establishment:		
Computers	+100%	Funded by library, and cost will be amortised over time
Monitor	+100%	Funded by library, and cost will be amortised over time
Software	+100%	Funded by library, and cost will be amortised over time
Scanner	+5%	A necessary component in teaching technology
Courseware material	+100%	Funded by institute, amortised over time
Annual:		
Upgrade computer	+50%	Shared cost with library
Upgrade monitor	+20%	Shared cost with library
Upgrade software	+100%	Shared cost with library
Recurrent:		
Training teachers in online delivery	+10%	Appointment of flexible delivery co-ordinator
Upgrade online courseware materials	+10%	Appointment of flexible delivery co-ordinator
Teacher preparation	-75%	Online courseware materials
Assessment	-75%	Electronic tests and quizzes
IT maintenance	+100%	Provided by Institute
Internet connection	+80%	
Potential income:		
Sale of courseware materials	+100%	Yet to be investigated, but, based on experience of sale of workbook, likely to be profitable

External delivery

For the external online delivery, the cost needs to be assessed against the delivery of traditional paper-based material. What is involved in paper-based external delivery? All course materials—workbooks, kits, teaching instructions and tests —are packaged and posted to the student. The student may phone, fax or email inquiries to the teacher about any course issues. The assignments and tests are mailed back into the centre. These are manually processed and the assignments and supervised tests logged in student records and manually marked. The results need to be posted back to the student with any comments. This heavy administrative process is handled by clerical staff while the marking is done by a teacher.

In the case of online delivery, once the courseware material is set, it is accessed via the internet. Some hardcopy material is required to inform the online student of their passcodes and to let them know who their primary contacts are if they experience technical, academic or administrative difficulties, preferably via email. All quizzes and tests are conducted online, and the marking is automatic. Only assignments need to be mailed in. The matching of tests with the student is done electronically. Although this has not yet become apparent because the online student numbers are small, the online administration cost will be substantially less than the paper-based system. The use of email has already substantially reduced the cost of the telephone and fax.

The reduction in cost of the teaching load in flexible delivery (including both paper-based and online) compared with classroom delivery is already being felt. This can be seen from the data student contact hours and staff hours in the table below, provided by the centre.

Table 15: Comparison between external and internal student contact hours, staff inputs and estimated salary cost for school contact hours

	External students	Internal students
Student contact hours	17 442	30 189
Staff	teaching 0.6 administration 0.8	teaching 1.8 administration0.5
Estimated salary cost per contact hour*	$3.1	$3.5

Note: *Based on an assumption of $50 000 pa for teaching input and $30 000 pa for clerical input.

These figures, based on assumptions about the average annual salary for teachers and clerical staff, suggest that external distance education is slightly cheaper to deliver due to the lower input of the more expensive teacher resource and greater input from the less expensive clerical input.

In relation to external online delivery, the cost for technology, maintenance and IT support is borne by the student, or employer if the student is at work. So too will the courseware materials (workbook) if these can be put online to be downloaded by the student. internet connection will also be less costly than the classroom online option. The major cost centres and the estimated cost over and above paper-based external delivery are presented in the table below.

Table 16: Estimated additional costs of external delivery compared with paper-based delivery

Item	Cost	Comment
Establishment:		
Courseware material	+100%	Funded by institute, amortised over time
Recurrent:		
Training teachers in online delivery	+10%	Appointment of flexible delivery co-ordinator
Upgrade online courseware materials	+10%	Appointment of flexible delivery co-ordinator
Teacher preparation	-75%	Online courseware materials
Assessment	-75%	Electronic tests and quizzes
Telephone calls	-30%	Email contact
Fax calls	-75%	Email contact
Internet connection	+10%	
Potential income and cost saving:		
Sale of courseware materials	+100%	Yet to be investigated, but based on experience of sale of workbook, profitable
Publish workbooks	-50%	Deliver as workbooks as online PDF
Administration	-25%	As more students use the online option administration time, postage and handling will be reduced

Potential for cost-efficiencies

The funding of modules such as Anatomy and Physiology is based on a student contact hour rate irrespective of the course delivery mode. The costs involved in the course delivery basically comprise the technical infrastructure (computers, labs, classrooms, etc.), teaching materials (workbooks, courseware), administration costs (phones, fax, email, internet, stationery etc.), teaching and administrative costs. For an individual centre or department at Box Hill TAFE, a proportion of the budget will also go to the institute (for external services including building costs, library services and IT services).

The cost efficiency of the delivery can be increased by enrolling greater numbers of students in the course (below a certain line where the quality of teaching can be maintained); reducing administrative costs; establishing more efficient teaching practices to minimise teaching time (requiring less preparation, less manual assessment); and/or increasing numbers of students in a single 'class').

The experience of the Centre for Animal and Biological Studies with the use of online delivery highlights several cost-efficiencies. The use of self-paced courseware materials (whether online or paper-based) in a classroom context brings efficiencies in teacher preparation. Online delivery for internal students also offers a larger degree of teaching flexibility where the teachers are not locked into specialist knowledge areas, and can move across the curriculum as the courseware information is provided. The online courseware with the self-assessing quizzes and supervised tests also substantially reduces the teacher assessment load. This needs to be considered against the initial cost of developing the courseware material and providing the technology (computers, software and internet links) in the classroom. However, both these costs can be amortised over time, and secondly, as in the case of the paper-based material, the online courseware could also generate income. Increasing numbers of students in a single 'class' is only a possibility at this stage.

External online delivery brings much higher cost-efficiencies. The technology costs to the provider are minimal because they are borne by the student. The administrative workload will reduce substantially when the number of students increases. When all of the courseware material is online, the cost of publishing the workbooks will decrease. As greater reliance on email becomes the norm, cost for telephone, fax and postage will continue to decline. Additional funding will be needed for teachers' professional development as they will need to be trained in online delivery techniques. There will also be a need to continue to revise the online courseware, which is an additional cost, but this is far outweighed by the cost savings.

Effectiveness

Two measures of effectiveness are available. One measure compares the module completion rates pre-online and online delivery (see table 17). As the external delivery has only just begun in 2001, figures on student completion rates were not available at the time of the study. However, the completion rates for internal on-campus students are available, and they are presented in the table below.

Table 17: Module completion rates before and after the introduction of online delivery for internal students

Year	Module	Completion rate
1996	Anatomy & Physiology 1	13 out of 22 (59%)
	Anatomy & Physiology 2	19 out of 24 (79%)
1999 (online)	Anatomy & Physiology 1	16 out of 17 (94%)
	Anatomy & Physiology 2	13 out of 15 (87%)

At face value, the module completion rates for internal students show a marked improvement for online delivery compared with non-online, in Anatomy and Physiology 1 from 59% to

94% and in Anatomy and Physiology 2 from 79% to 87% in another. This improvement could be due to other factors in addition to the provision of online self-paced resources and self-assessment. For instance, there are marked variations in the entry pathways of students enrolling in the course. For instance, most of the 1999 students were part-time and not coming via a Victorian Certificate of Education (VCE) stream, whereas the 1996 students were mostly from VCE. The 1999 cohort, being part-time and generally from an older age group, could have more incentive to complete the course.

Another way of addressing the issue of learning effectiveness is to survey students. There were nine respondents to the survey—mostly female and between the ages of 15 and 19. All had completed their Year 12. Respondents were spending up to 15 hours/week on the modules, and eight out of nine expected to complete the course. Significantly, eight of the nine respondents stated they would undertake more online courses in the future.

The questionnaire responses show that the major online aspects used by the students are assessment, course content, instructor email and student email. The students valued online assessment and instructor email more highly than course content and student email. Overall, respondents valued face-to-face and online instruction at about the same level.

As the majority of respondents knew how to use the computer and internet prior to the course, the course did not significantly increase their understanding of computers, the internet or emailing. Respondents were divided over the issue of whether online training provided more relevant or quicker information access, although most agreed that it made it easier to complete. Most did not believe it improved their motivation. In the main, however, respondents found that communicating with teachers and other students online was easy and that it did improve teacher access and feedback response. The fact that online learning allowed the student to complete learning tasks when it suited them and at their own pace was regarded by most respondents as an important benefit.

Table 18 shows the student satisfaction ratings of various aspects of the Anatomy and Physiology modules, and these ratings are benchmarked against the satisfaction ratings of all students nationally who completed their course during 1999 and graduated with a qualification from a course (N = 41 600).

Table 18: Satisfaction ratings given by students in the Anatomy and Physiology course compared with satisfaction ratings of all TAFE graduates 1999 (%)

Aspect of training	Anatomy & Physiology	National survey
Instructors' knowledge of subject content	8.4	8.2
Instructors' ability to relate to students	6.8	8.0
The balance between instruction and practice	6.1	7.5
Making methods of assessment clear	8.6	7.7
The subject content reflects industry practice	6.5	7.6
The presentation of training material	6.8	7.5
The quality of the equipment provided for you to practise your skills	5.5	7.3
Having enough equipment for you to practise your skills	6.2	7.2
Access to learning resources	6.2	7.8
The convenience of both venue and class times	6.4	7.7
The usefulness of the training for your job prospects	6.9	7.7
The overall quality of the training you have received	7.8	7.9

Note: Not applicable, don't know and no response have been excluded.

Source: NCVER (2001)

The most significant difference in the satisfaction ratings between the Anatomy and Physiology course and the national satisfaction ratings relates to the methods of assessment. This higher rating for assessment reflects the course's extensive use of the self-assessment tools as part of the online delivery arrangements. However, in the context of the items related to quality of equipment, the access to learning resources, balance between instruction and practice and the instructor's ability to relate, lower satisfaction ratings are noted compared with the national average.

Overall, the students rated their satisfaction with the quality of the online delivered training on a par with the national average for traditionally delivered courses. They also indicated their interest in undertaking further courses online. They believed online delivery made learning 'easier', and they valued its flexibility in terms of learning at their own pace at their own time.

The average satisfaction rating of the course may well reflect the limited amount of the interactivity used, apart from the assessment quizzes, in the Anatomy and Physiology modules. Essentially, the modules rely on self-paced instruction and self-assessment. The online communications features (chat, bulletin board) and interactivity (games, puzzles, simulations, animations etc.) that could be a part of online delivery have not yet been explored. It, therefore, remains to be seen what impact this expansion of online activity (which the teaching staff acknowledge needs to be implemented) will have on future student perceptions and satisfaction.

From a cost-effectiveness point of view, the online delivery has met the practical and functional outcomes of the course (completion rates), but has not led to higher-than-average levels of student satisfaction.

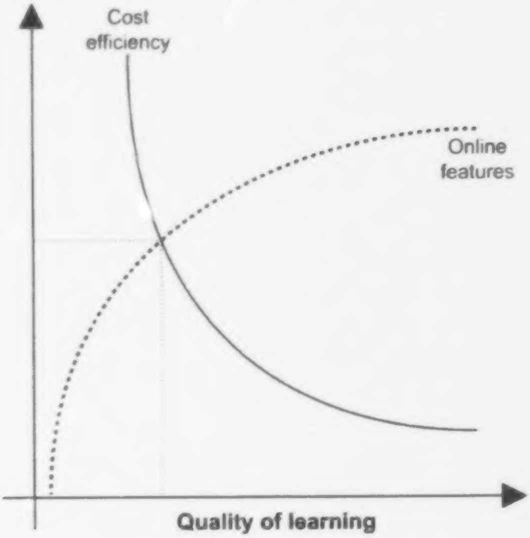
Conclusion

This case study has highlighted the cost-effectiveness of online delivery modules using a assessment-driven teaching model. However, the application of the knowledge learned through quizzes and self-paced resources may be problematic. Although this form of assessment is appropriate for this technical–scientific knowledge, it does not present much opportunity for problem-solving or collaborative learning. In other words, the self-assessment, although highly successful from a cost-efficiency point of view, may be affecting the quality of the learning outcome. Therefore, staff at the centre are keen to continue to build the online learning resources—to add more interactivity into the courseware material (animations, processes that can be simplified by multimedia applications) and to establish stronger online communication through email and bulletin boards.

Of course the dilemma here is that, more interactivity in the courseware material means higher costs of production, and adding online communications increases the amount of time necessary for the teaching staff to communicate. This dilemma is posed in a graphical form (figure 2) with cost represented on the vertical axis and learning quality on the horizontal axis. There is a point in which the cost efficiency, quality of learning and use of multimedia (online features) intersect and this is the optimum point for which training delivery will be effective.

The delivery of Anatomy and Physiology demonstrates that, by carefully matching the course content to those aspects best suited to online delivery (in this case fixed choice tests for assessment purposes), cost-efficiencies can be gained. Nevertheless, the less-than-national-average satisfaction ratings of the students suggests that there is scope to increase learning effectiveness by using more of the interactive features that online delivery offers. These results also suggest that other, more interpretative subjects are likely to offer a greater challenge in identifying how to reach the optimum balance between efficiencies related to costs, appropriate use of technology and quality learning outcomes.

Figure 2: Optimum training delivery



The cost-effectiveness of flexible learning in a corporate setting

Richard Curtain and Bruce Thomson

Introduction

Qantas Airways employs approximately 30 000 staff across a network spanning 124 destinations in Australia, the Americas, North and South East Asia, UK/Europe, and the Pacific. The Corporate Learning and Development Department is responsible for the corporate training needs of all Qantas staff. Qantas College is a brand name of the Corporate Learning and Development Department. Qantas College has recently been granted quality endorsed training organisation (QETO) status. In addition to this, Qantas College has received endorsement by ANTA for the development of the Qantas Training Package. The majority of courses offered on Qantas College Online (QCO) have been mapped against the competencies in this package so learners are able to work towards achieving a qualification by completing a series of online courses.

In 1995, Qantas recognised that difficulties in obtaining staff release from the workplace for training was a key barrier to supporting change in the organisation. The idea of online learning began as a means for increasing the opportunities to train and to distribute access to training on a global scale without incurring a huge infrastructure cost. It was also judged to be important to have the ability to customise training content to meet Qantas's specific needs.

Therefore, a learner management system was purchased to provide the platform for the delivery of online training. The platform also provided the means to evaluate the training and to track and manage learners as they progressed through their courses. At this stage Qantas College absorbs all costs associated with Qantas College Online and has not moved to a charge-back model. The reduction in training release costs, greater accessibility and the increase in measurable outcomes were seen as the key benefits to be gained from online delivery (TMP WorldWide Learning nd).

Qantas College commenced the delivery of online programs in 1997 with three courses—Communication Skills, Conflict Resolution and Handling Difficult Customer Situations. QCO courses today cover a broad range of skills and knowledge including customer and business focus, training skills, language and literacy, cultural awareness, and a range of technical skills. The majority of courses are associated with generic skills and a number of courses focus on IT skills development. In total, there are 65 courses available. A supervisory development program (SDP) has also been developed. The SDP is comprised of five training courses which, together with two elective courses, can lead to a qualification of Certificate IV in Leadership and Management. The SDP is delivered either via classroom, online, or a combination of classroom/online. At the time of this study, approximately 600 new Qantas instructors had taken the opportunity to undertake the supervisor development program.

Individual business units within Qantas are responsible for sourcing and/or delivery of technical training for their staff. The priority within business units is on the provision of training specific to occupational groups, most of which are currently delivered in traditional classroom settings. A number of business units are exploring the possibility of utilising QCO for the delivery of some of their technical training. Qantas College worked with a number of

Business Units to develop or convert such courses for online delivery as a means of supporting or providing alternatives to existing training. The aim has been to create a system that will allow business units to align training with individual and business performance goals.

Approximately 7000 Qantas staff members have registered their interest in taking a course with Qantas College Online. This represents a 23% uptake rate in relation to the total workforce of almost 30 000. In 2001, 3795 staff have enrolled or are participating in courses. The vast majority of course participants (80 to 90%) are based in Australia, reflecting the overall geographical distribution of Qantas staff.

Nature of online learning

Some 65 courses are currently offered online. The courses fall under specific training providers including airport services, information technology, cabin services, security and flight operations. Many courses make use of workplace assignments and/or assessment to ensure the transfer of learning to the workplace. Online delivery in a classroom setting has been trialled and may be used again to encourage group learning. Some groups participating in the supervisor development program have opted to undertake the 'hybrid' model which combines classroom and online delivery. The hybrid model has proven quite popular and successful with learners.

A new version of the QCO site was launched in March 2000. Feedback from learners indicated that the site was not considered to be as user-friendly as it could be, with course nominations taking up to seven days to be approved. The site is now integrated with the human resources information (HRI) system, which allows the learner to register, nominate and commence a course all in one sitting.

Considerable effort has been made to improve the appearance and useability of the site. On entering their course, the learner is introduced to 'Odyssey Airlines', a virtual airline. This airline mirrors the philosophy of Qantas and all situations and problems within courses are presented in the context of Odyssey Airlines. Odyssey Airlines is seen as an effective environment in which learners can solve problems and consider situations in a non-threatening, yet relevant, way. Qantas College is continually looking at ways to improve navigation within courses.

Regular 'online orientations' are offered to staff to familiarise them with QCO and the associated technology. In particular locations around Australia a tutor/co-ordinator is available to assist staff to become familiar with learning online and to provide ongoing support. Qantas College has established a number of 'learning centres' which contain computers dedicated to learning. These centres have increased access significantly for staff in workplaces where there is a lack of computer resources available to them. When a new learning centre is established, a Qantas College staff member visits the site and conducts a 'briefing session' to raise awareness of the benefits of online learning and availability of QCO courses. The Qantas Global Support Centre offers first-level support by assisting staff who have technical problems with internet connections, access and installation, set-ups etc.

QCO tutors are provided with a comprehensive introduction to the QCO learning environment and Qantas College Online maintains constant contact with each tutor to identify and address any problems that arise or become aware of any possible enhancements. Tutor forums are held twice annually to discuss enhancements to QCO, discuss current Qantas College initiatives and to workshop any new ideas.

Feedback from a recent Qantas College Online evaluation report indicated that learners are well satisfied with QCO and are enjoying the opportunity to learn at a time and place that suits them. Of the 700 learners who completed the online evaluation survey after completing a course online, 92% reported being satisfied with the course. The report highlighted some key barriers to learning, including lack of time to complete courses, technical problems, lack of or delayed tutor responses, and the learners' own lack of motivation. As a result of the feedback obtained in this evaluation report, Qantas College has devised strategies where it is possible to address these barriers.

The evaluation report has revealed that 47% of learners had undertaken their online course at home, 25% in a learning centre and 19% from their work area. The launch of the company intranet site has also increased access to the QCO site significantly with a large number of computers in the workplace now having direct access to the QCO website. However, the issue remains that computers in the workplace are generally being fully utilised for work purposes. Qantas College continues to investigate the possibility of establishing learning centres in a range of work environments. Information from the evaluation report also shows that, on average, learners are completing 78% of their online course in their own time and 22% in work time.

Learners can enrol in courses at any time. All courses are self-paced and most are tutor-supported. Each course is designed to be undertaken in 20 to 30 minute sessions. Nominal hours are set for each course and this determines the ideal timeframe for a learner to complete the course. Most course study guides are based on the learner spending one hour per week on the course. The durations were determined by extrapolating from classroom delivery, with two days in the classroom being equivalent to eight hours online. For example, the Business understanding course is estimated to take eight hours of course time plus assessments so it is recommended that the course be taken over eight weeks.

Study guides are provided for each course, showing learners when they should complete each component of the course and assessments. Tutors also encourage learners to complete the course within the timeframe. Tutors are available outside normal working hours and on weekends. Tutors are required to reply to learners within 48 hours, preferably with a proper answer or at least an acknowledgement.

Qantas College Online uses a group management arrangement to track course participants and to ensure they complete courses within the nominal duration. All learners commencing a course within a certain timeframe, ranging from a month to three months, are allocated to a single group or sub groups where numbers require it.

Costs

Information was sought on two sets of cost: establishment and recurrent costs. The respondent was asked to state in relative percentage terms whether the cost of these components for an online course were less or more than if the course was delivered using traditional methods. Information was not provided on the actual establishment costs. The differences highlighted were 100% less expenditure on classroom facilities such as blackboards/whiteboards, overhead projectors, and other general classroom equipment.

By contrast, 100% additional expenditure was noted for training web writers, web page development, multimedia development other than web page development. Items on which establishment costs were said to be the same were: printers, training teaching staff, training administrative staff, and training management. It is noted that it was difficult to identify many of the capital costs associated with computers as the individual business units covered these costs.

Table 19 relates to recurrent costs. The differences in the recurrent costs between the traditional classroom-delivered course and the online delivery are shown in percentage terms where applicable. In relation to many items, recurrent expenditure was regarded as about the same.[5] However, in relation to some items, additional expenditure was required. This expenditure related to teaching staff (50% more), maintenance of technological equipment (10% more) and the cost of internet connections (100% more). The items on which there was less expenditure were: lost production time (50% less) and travel for employees to attend classes (100% less).

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[5] These items were: training for administrative staff, training for management, training web writers, assessment marking, wages for teaching staff, wages for administrative staff, wages for management, IT support [illegible] learners (e.g. help desk), student workshops on using technology, telephone [illegible] fax calls, insurance and security.

Table 19: Comparison of recurrent costs for traditional and online delivered courses.

Recurrent cost component	More or less
Training teaching staff	+50 %
Maintenance of technological equipment	+ 100 %
Internet connections	+ 100 %
Lost production time	- 50 %
Travel for learners/employees	- 100 %

Effectiveness

Online delivery is seen as being more effective at providing more relevant information and helping the learner to gain a quicker understanding than do traditional training methods. The use of information technology is seen as a way to increase the learner's motivation to continue working on the course and to complete it.

Initially, the course completion rate (overall number of online completions by the total number of enrolments at a designated time) was not high. In September 1999, the overall completion rate was only 20.9%. A year later (September 2000) it had risen to 31.6%. Several reasons for this improvement could be identified. A streamlined registration and enrolment process was introduced enabling staff to start a course immediately. Study guides were introduced for each course to assist learners to complete their course in the recommended timeframe. Other changes introduced over this period were the establishment of a learner management strategy to identify any barriers to the completion of the course. Attention was also paid to identifying more computer access points for learners. There was also an increased effort to market the online courses internally to the wider organisation.

The level of satisfaction with Qantas College Online, another measure of the training among the 705 completers who filled out an evaluation questionnaire, was high, with 94% stating that they were very satisfied or satisfied. A high proportion (92%) also agreed that their online course was relevant or very relevant to their job. Learners were also asked to nominate whether they believed they had improved their performance and work outcomes as a result of the course. The results are shown in table 20.

Table 20: Course completers' assessment of the impact of their training, by %

Statement about work performance	Proportion agreeing and strongly agreeing with statement, by %
My job performance has improved (as measured by KRAs or KPIs)	75
I am a more effective member of my team	84
I am better able to provide quality service to 'external' customers	76
I am better able to provide quality service to 'internal' customers	83
I am taking responsibility for my own learning	94
I am more confident in my ability to do my job	86

Note: KRA = key result areas; KPI = key performance indicators

These results suggest that employees' awareness of the importance of taking responsibility for their own learning is a major outcome of completing an online course. As noted in the other case studies, online delivery places more onus on the individual learner to manage their own time and priorities more effectively to achieve designated learning outcomes than does a group-based traditional learning mode.

The importance of self-management in online learning is confirmed by several of the most commonly mentioned barriers to learning identified by the course completers: lack of time and the learner's own lack of motivation. The other barriers identified were the lack of feedback from the online tutor, lack of access to a computer at work for learning purposes, and technical problems with accessing email. It is important to note that each of these perceived barriers to training refers especially to the demands of online delivery.

This also suggests that course completion rates could be improved if the sort of structure and support available in a traditional teaching mode is more readily available. Classroom instruction requires a designated time away from work for training and the face-to-face interaction is a valuable means of support. Designated time for online learning in the workplace and opportunities to meet in face-to-face workshops may help overcome some of the perceived barriers to online learning.

Teething problems with online delivery such as technical problems related to email contact with tutors makes it difficult to compare the effectiveness of the online delivery with traditional classroom modes. Ideally, online tutors potentially can offer more focussed and tailored feedback of higher quality. This is because their responses are written and thought through more than might be expected in a verbal response in a classroom setting. The lack of communication with other learners was another feature of online delivery that may have limited the effectiveness of the learning. Qantas College is exploring ways of encouraging group learning in online courses.

Conclusion

This case study has highlighted the issues of cost and effectiveness of the sole use of online delivery independent of other teaching modes for training courses in a large and geographically dispersed enterprise. The case study has shown the advantages of flexibility in terms of location, with nearly half of the course completers working from home, and 7% using both work and home as access points. Special purpose computer access points in the form of learning centres were also utilised as access points by a significant group (25%) of learner.

Online delivery has also been successful in addressing a major organisational barrier to greater access to training—the reluctance of workplace supervisors to release employees for training because of the time required to attend a training course. As most learners (78%) complete their online course in their own time, this barrier has been removed.

However, the flexibility of online delivery comes at a cost to both the individual employee and to the enterprise. For employees working from home, there is the establishment cost of a computer (or an upgrade required to access the internet), the recurrent costs of internet access, the printing of materials as well as the cost of the individual's own time. Within the business units, there is the additional establishment cost of ensuring that employees who wish to learn at work have access to a dedicated computer. There is also the recurrent cost in some locations of a co-ordinator who is made available to introduce staff to online delivery. The recurrent costs for the enterprise associated with online delivery relate to the use of external tutors and the maintenance of technical equipment.

On the other hand, flexible learning through online delivery delivers considerable savings to both the individual employee and the enterprise compared with face-to-face instruction. The main source of the savings to the enterprise is from the lower demand on the employee's productive time and the lower transaction costs in terms of travel and accommodation costs associated with using a physical facility. The ability to access the training outside work hours and during downtime at work means that there is less disruption to normal workloads. The advantage to the individual employee is that they are more likely to obtain approval to undertake a training course as it requires fewer fill-in resources to release the employee for the training.

Thus online delivery makes it is easier for individuals to make their own decisions about undertaking further learning related to work and their career prospects within a large enterprise. As the costs can be more easily shared by the individual and the employer, access to training can be more easily provided by the individual business units whose prime concern is meeting their productivity targets while keeping their costs low. As many of those undertaking an online course are doing to so to improve their career options within Qantas, this cost-sharing appears reasonable.

In the longer term, both parties are benefitting from the training. However, cost sharing in the short term makes it possible to reduce the resistance from management in the employee's current business unit as further training may merely increase the chances that an employee will move to another business unit within the organisation. Lower training costs, achieved through lower costs to the business unit, helps to remove managerial resistance to encouraging employees to undertake more training.

The case study has also brought to light important considerations about the effectiveness side of the question about whether flexible learning strategies are cost-effective in a corporate setting. If effectiveness is judged by the proportion completing their course (this seems a reasonable assumption from both the enterprise and the individual employee's perspective as discussed above), it would appear that a number of barriers need to be addressed.

One other barrier appears as a basic constraint limiting effectiveness. This is the learner's own lack of motivation. This is a common barrier to learning that is exacerbated by the relatively impersonal nature of online delivery.

This barrier is only likely to be addressed if support is provided to encourage the level of interaction that people expect from well-conducted, face-to-face interaction. Online discussions and bulletin boards may provide increased interaction opportunities which lift employee motivation to participate and stay with the course. However, these also require a skilled facilitator and hence greater expense. All this suggests that enterprises adopting online delivery need to go through several steps to work out the right balance between keeping costs low while looking at ways to increase learning effectiveness. The cost-effectiveness of online delivery in a corporate setting is not a simple matter of applying new technology. Regular evaluation of the impact is needed. However, the longer-term cost savings with the capacity to deliver a more customised and up-to-date product are likely to ensure that online learning will be the major form of training in enterprises in the future.

Enterprises are likely to view online learning as a cost-effective form of training for reasons that do not apply to external education and training providers. First, online delivery minimises the loss of productive time by bringing the training product to the employee and not the other way around. Second, costs can be distributed more equally between employer and employee, reflecting the economic benefits that training confers on both parties. Third, online learning makes it much easier to deliver a customised training product tailored to the needs of the enterprise. For these reasons, enterprises are much more likely than other training providers to view online learning as worth the upfront investment.

The cost-effectiveness of flexible learning strategies: International Hotel Management, Regency Institute of TAFE, South Australia

Monica Redden

Overview

The focus of this case study is the cost-effectiveness of the online delivery of the Bachelor Degree in International Hotel Management, offered at Regency Hotel School by the International College of Hotel Management (ICHM) (hereafter referred to as the Regency Hotel School) based at Regency Institute of TAFE, Adelaide.

This case study explores the added costs and benefits gained by introducing online delivery into a face-to-face and distance learning education program. The online course enables students who are fully employed to undertake further study beyond their Diploma in International Hotel Management, without being required to attend classes in person.

Organisational context

The International College of Hotel Management is a joint project of the Swiss Hotel Association, Le Cordon Bleu, Regency Institute, the South Australian Government and a private enterprise. The college is physically located at the Regency Institute of TAFE, in Adelaide but the facility operates independently of the TAFE system in South Australia. Nine lecturers are involved in online delivery to students completing the degree. However, computer support is provided by TAFE SA's OnLine Education Services Unit, which is responsible for ensuring the courses are accessible, as well as providing technical support and professional development to staff.

TAFE SA OnLine Education Services provides the administrative and technical support related to all of the modules, including:

- ensuring courses are accessible to students-including student registration for access
- providing technical support to lecturers and students via the WebCT help desk
- provision of online professional development relevant to online delivery

The OnLine Education Services unit operates a WebCT help desk during normal working hours (8 hours per day) responding on demand and guarantees a response to all inquiries within 24 hours. The Hotel School utilised the services of OnLine Education Services in the development of course material and training of lecturers on online delivery. Funding for the OnLine Education Services unit is generated through 50% TAFE SA funding and 50% sale of products and consultancy fees. No direct fees are applied to TAFE SA institutes for the provision of services.

Thirty-five students were enrolled in subjects for the Bachelor Degree in International Hotel Management during 2000. In Semester II, 17 students were actively enrolled, nine participated in face-to-face delivery and eight were distance education students engaged in online delivery only. The students undertaking the face-to-face delivery also completed the managing internet marketing subject online. This was achieved primarily by receiving hard copy material and completing the subject online utilising the computers on campus or from their home.

Students studying through the distance education mode lived in South Australia, or interstate with a small number of students living overseas. Some students who are taking the bachelor degree course entirely online and who do live in Adelaide prefer this delivery mode due to heavy work and family commitments. However, the profile for students enrolled in semester I, 2001 provides an indication of the geographical spread of students undertaking the online course: Thailand (1), Indonesia (2), USA (1), Canada (1), Hong Kong (1), South Africa (1), Japan (1), South Australia (1) and Victoria (1).

Nature of the course

The Regency Hotel School has offered the Bachelor Degree in International Hotel Management qualification since 1999. Entry to the bachelor degree is via the Diploma in International Hotel Management (or equivalent). The bachelor degree is delivered in 25 weeks full-time (or equivalent part-time) and students must enrol and satisfactorily complete five core subjects: International Marketing for Hospitality Business, Financial Management for Hospitality Business, Strategic Management for Hospitality Business, Emerging Trends and Issues in Tourism and Hospitality and Information Technology Management for Hospitality Business. They must also successfully complete three of the following electives: Australia–Asia Business Relations, Gastronomy, Languages, Research Project, and Advanced Wine Appreciation. All core subjects and two electives are offered online.

Enrolment occurs semester by semester. The Hotel School has decided to manage the program this way because it is believed that the structure supports student input and interaction between students. The emphasis of the course is self-directed and not self-paced learning. Times are set for group activities and time-lines are provided for completion of activities and assessment. Students can only access the online material within a limited time period. The Regency Hotel School has found from previous self-directed courses (not online) that, because students tend to fall by the wayside if they do not have clear parameters for course completion, the current structure assists students to keep motivated.

The common commencement and finishing dates tend to support the development of group work and enables continuity in debate between students. The structured timing also makes it easier for the lecturer to manage and keep discussion going among a critical mass of students. The issue of continuous enrolment and flexibility is one potential benefit of online learning. However balancing this is the need for some certainty in the workload. Also administrative requirements mean deadlines are still important to meet funding requirements.

As noted above, the Bachelor of International Hotel Management is delivered both face-to-face and online. The face-to-face delivery consists of classroom participation of between 45 and 60 hours per module over a semester period with supplementary learning through readings, assignments, discussion of case studies and other related activities. Students undertaking the face-to-face delivery do not have access to the online course material. The Regency Hotel School, however, is currently reviewing the possibility of providing online access to face-to-face students to supplement their studies.

The online delivery is based on a distance education model in which enrolled students do not receive any face-to-face teaching. The online course consists of a mixed medium of learning materials and tools. Students receive hard copy readings, CD-ROM-based instructions for some of the modules and references and textbooks. Costs for materials are included in the course fees. Instructions for each module are self-directed. Instructions are delivered through online and CD-ROM media and contain self-assessment exercises. Asynchronous chat rooms are also used for students and lecturers and online noticeboards for public notices.

Students are required to join in some discussion groups, depending on the nature of the subject and topics. For example, if students are learning about marketing techniques, involvement in a discussion group enhances the students' learning by discussion of ideas and concepts with other students. However, if a student is undertaking accounting principles and exploring the functions of worksheets, there is limited advantage in joining discussion groups. There is no synchronous communication within the course due to complications related to finding a convenient time for students who are studying across a wide geographic spread.

Lecturers generally spend between two to three hours a week attending to online inquiries and discussion groups. The course is self-directed within the confines of students having to complete assignments and assessment in accordance with set timelines. While the degree course is not totally based on the internet, teachers have the capacity to email relevant websites and references. Online presentation of the course also enables changes to the course content to be made easily through one action and within a short period of time. Assessment is also conducted online. With the exception of a limited number of exams, in which arrangements for supervised conditions need to be arranged, all assignments are undertaken online.

Costs

This section identifies the costs incurred at various stages of setting-up and delivery of the bachelor degree course online. Table 21 gives an itemised breakdown of relative costs of online delivery compared with face-to-face delivery for each stage of course development and delivery.

Table 21: Costs comparisons between online and face-to-face delivery

Item	Cost	Comment
Establishment costs		
Computers/hard drives	Same	Use of existing equipment
Monitor	Same	Use of existing equipment
Software	Same	Use of existing programs
Scanner	Same	Use of existing equipment
Routers	Same	Use of existing system
Server upgrade	Minor increase	Costs incurred in fees paid to private provider
Upgrade of microchips	Same	No change to existing system
Ram	Same	No change to existing system
Furniture	Same	No new furniture required
Blackboards/whiteboards	Same	No new furniture required
Overhead projectors	Less	No new furniture required
Training teaching staff re online delivery	Increase specific costs unknown	Nine of the Hotel School staff participated in the ToolBox and LearnScope projects. All ICSM teaching staff (12) completed the introduction to online tools e.g. chatrooms, forums, direct email. Education Manager, Flexible Delivery Unit dedicated over 50% of his time to his own professional development and product research.
Training administrative staff re online delivery	Same	The administration is primarily managed via Online Ed Services.
Training management re online delivery	Increase	Education Manager, Flexible Delivery Unit has participated in several ANTA funded projects.
Training web writers	Same	Outsourced the work
Web page development	Same	Outsourced the work
Courseware material	Increase	Staff were involved in the development of content for 8 modules. The team outsourced the web authoring and graphics to instructional designers. Staff modified and edited the modules throughout the developmental phase. Total cost for 8 modules $75 000 (excluding teacher time costs, including salary costs for Education Manager, Flexible Delivery Unit).

Item	Cost	Comment
Courseware material (cont.)	Increase (cont.)	Twelve teachers also participated in the trial delivery of one module as part of their workload.
Multimedia development other than web page	Increase	A range of electronic tools was developed to support the course. Costs were incorporated into the budget for courseware materials (as above)
Annual:		
Upgrade computer	Same	Costs absorbed within TAFE SA expenditure.
Upgrade monitor	Same	Costs absorbed within TAFE SA expenditure.
Upgrade printers	Same	Costs absorbed within TAFE SA expenditure.
Upgrade hard drives	Same	Costs absorbed within TAFE SA expenditure.
Server upgrade	N/A	Online Education Service provides the technical support for the course. They recently upgraded the capacity of the service at a cost of less than $5000.
Software upgrade	Same	Costs absorbed within TAFE SA expenditure.
Ram upgrade	Same	Costs absorbed within TAFE SA expenditure.
Web page enhancement	Same	Outsourced
Multimedia enhancement other than web page	Slight increase	Very limited use of multimedia. Some CD-ROM-based instructions.
Recurrent:		
Training teachers in online delivery	Increase	Existing staff participate in professional development. Education Manager, Flexible Delivery Unit now spends .5 of his time co-ordinating and developing the online aspects of flexible delivery in the Hotel School.
Training administrative staff in online delivery	Increase	As the concept of online delivery is integrated into the campus infrastructure, there will be an increasing demand for administrative staff to be trained.
Training web writers	Increase	As the online components expand there will be an increasing expectation that staff will develop skills as web writers to decrease the costs for outsourcing the instructional design.
Assessment marking	Same	Possible less costs incurred due to savings in post, printing materials and handling.
Wages for teaching staff	Same	There has been no increase in teaching staff with the introduction of online delivery.
Wages for administrative staff	Same	There has been no increase in administrative staff with the introduction of online delivery
Wages for management	Increase	The Education Manager, Flexible Delivery Unit, increased the amount of time spent on co-ordinating and delivering online to the equivalent of .5.
Maintenance of technological equipment	Same	TAFE SA manages the maintenance program. No additional costs to the Hotel School.
IT support for staff and students	Same	WebCT help desk provides the technical support for the course material. No additional costs to the Hotel School.
Student workshops on using technology	Increase	Currently considering the introduction of an *Introduction to online education* as a pre-requisite for enrolment to online subjects.
Internet connections	Increase	Increased costs for teachers who work from home.
Telephone calls	Same	
Fax calls	Same	
Insurance	Same	
Potential income:		
Sale of courseware materials	Unknown	
Lifelong learning students	Increase	Students who would traditionally not participate in the course are now paying full fee for the fourth year.

Establishment costs

The Regency Hotel School incurred no additional capital costs in establishing the online course. Most equipment and support services were already funded through TAFE SA's existing resources. However, TAFE SA OnLine Education Services unit purchased a server at the cost of $5000 and recently upgraded the server's RAM capacity at the cost of $500.

The initial establishment of OnLine Education Services unit incurred a range of set-up costs such as funding a dedicated office space, supplying a dedicated computer and desk for the WebCT help desk function and purchasing an independent server, separate to the TAFE SA server. Costs for the development of this unit, however, not directly passed onto individual schools involved in delivering online courses. The information technology (IT) support team at Adelaide Institute of TAFE (the site at which the WebCT help desk is located) operates the WebCT Help Desk. The IT team provides IT support to the whole of the Adelaide Institute and allocates approximately 10% of their operating budget to supporting the WebCT help desk.[6]

Other set-up costs in relation to hardware were also minimal. All of the hardware for Regency Hotel School already existed as each teacher had a computer and was connected to both the intranet and internet. However, some teachers choose to also work from home, which requires them to fund their own computer and connection with an internet service provider.

In terms of establishment costs in relation to software, the course was originally set up using the services of a private company which utilised the TechWorks platform for module development and storage on their server. The costs incurred for the set-up phase were the fees paid to the company for storage and technical backup. However, a decision was taken to switch to the WebCT platform and to store the course's modules the OnLine Education Service unit's server.

Development costs

The Hotel School allocated $15 000 per subject to develop and implement the bachelor degree course. The costs included teacher and management time to research and compile content material to be written for delivery, outsourcing of instructional design and conducting a trial run with staff on the delivery of the course.

The education manager, Flexible Delivery unit commented that the costs in the early stages of development were largely due to the time spent researching and testing appropriate tools for the delivery of materials. The teaching team has learnt from the initial course design and modified their expectations and understanding of what is useful for facilitating learning. The novelty of online delivery in the beginning was seen to be largely in terms of being a methodology to reach a wide range of students. Included in this was the belief that good online delivery was dependent on the provision of high levels of multimedia presentation. However, with time the team moved to a new appreciation that successful online delivery is more dependent on good basic instructional materials and quality facilitation by the teacher. It is likely that if the team were to write the same nine modules for online delivery now the format and costs would be considerably reduced.

TAFE SA OnLine Education Services has estimated the development of a module similar to the Hotel School modules to be approximately $10 000 per module. This estimate varies according to the degree of content expertise required.

Recurrent costs

The Hotel School has not specifically identified the recurrent costs incurred in delivery of online course. However, the TAFE SA OnLine Education Services unit has estimated online delivery costs to be marginally less than the traditional face-to-face methodology. These figures are based on assumptions that the length of the course is 20 hours, minimum class size is 15 students and the period of time over which the course is taught is 6 weeks. The total costs for online mode of delivery is $2020 and on-campus mode is $2356. Table 22 outlines the basis for the cost estimation of two delivery modes.

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[6] Based on discussion with Martin Cielens, Director, TAFE SA OnLine Education Services.

The most significant sets of recurrent costs not covered in the estimated cost comparisons in table 22 (page 105) are professional development for staff and management time to co-ordinate the design and delivery of courses. These additional costs may change over the medium term as online delivery becomes more integrated within the institute. However no change is expected in the foreseeable future. Indeed, the education manager, Flexible Delivery Unit anticipates a continuation of increased costs for training and staff development as part of the strategic plan.

Effectiveness

The best available measure of effectiveness for the online course under study is the module completion rate. It was not possible to survey the students participating in the online course at the time of writing this case study, the reason being that the survey time clashed with the busiest time of work within the hospitality industry. Furthermore, as they had just completed their module, online contact had ceased.

As the bachelor degree is still a new course, introduced in 1999, it is not possible to determine the course completion rate because most students study part-time and have not yet completed the course. However it is possible to report on the work rate (proportion of students submitting work assignments) and the module completion rate. Ninety per cent of students enrolled for online delivery submitted at least one piece of work, and 85% of students completed the module in total. This rate is marginally less than the work and module completion rates for the face-to-face delivery mode in the same course, which is 95% and over 90% respectively. The fact that students are paying full fees for each subject is doubtless a key factor in explaining such a high completion rate in online delivery. There is also a time limit on accessing the online site in line with the length of enrolment time for each subject. This acts as a deterrent for those who might be tempted to delay completing their assessment.

Staff have identified several factors that may be inhibiting effectiveness of learning outcomes. The presence of overseas students, especially from non-English-speaking backgrounds, has raised particular concerns about the difficulties they may be having with online delivery. The educational experiences of many students from overseas have often been limited to traditional teaching methods. By contrast, online delivery is highly dependent on a student's ability to manage their own study and pace of learning to reach the desired outcomes of the course. It has been noted that the change to self-directed learning can be quite challenging for students not accustomed to it.

Related to this are the problems non-English speakers face with online delivery. This is particularly significant when students require assistance in interpreting materials written in English. Some of the Hotel School teaching staff are concerned that full-fee paying students who are undertaking the course entirely online may not receive full value for money compared with undertaking the study on campus, where students have easy access to lecturers for assistance. Their concern is based on the lack of readily available support for online learning in contrast to the support available to students when studying on campus.

Table 22: Cost comparison for recurrent course delivery online and face-to-face (F2F)

Item	Comments	Quantity	Time allocation	Rate ($)	Total online costs ($)	On-campus mode	Online hrs per class	F2F hrs per class
Orientation	Only applies where some/all students can get together e.g. via audio/video conference but would increase the cost		1.50	43	$65	$0	1.50	
Student induction to online environment	90% of enrolments will be new to the online environment. If F2F class uses web to access into, this may also apply		3.00	43	$129	$0	3.00	
Summative assessment	Two assignments per student	30	0.30	43	$387	$387	9.00	9
Formative assessment	Two assignments per online student. F2F students do fewer submittable formative tasks	30	0.25	43	$323	$161	7.50	4
Lecturer admin/ preparation	25% of teaching component		5.00	43	$215	$215	5.00	5
Lecturing (on-campus)		18		43	$0	$774		18
Respond to student queries		15	0.50	43	$323	$129	7.50	3
Print materials		15		15		$225		
Chat/bulletin board sessions		6	0.50	43	$129	$0	3.00	
Other fees	Online materials maintenance fee	15		15	$225	$0		
Clerical support			6.00	25	$150	$90		
Student services					$0	$0		
Online infrastructure		15		5	$75	$0		
Room usage		3		125	$0	$375		
On-campus overheads					$0	$0		
Total					**$2020**	**$2356**		
Assumptions	Cost per student enrolled	Online		$135	**$135**			
Length: 20 hours		Classroom				**$157**	$157	
	Teacher time allocation-hours per class	Online					36.50	
Minimum class size 15		Classroom						39
Period taught: 6 weeks								

Source: Online Education Services, TAFE SA

Conclusion

This case study provides an insight into the amount of planning and preparation that occurs before a new mode of delivery is introduced and has demonstrated that there is considerable research and trial and error that goes hand in hand with offering a new mode of delivery. The initial focus on expensive upfront fixed content involving CD-ROM based multimedia presentation gave way to a greater focus on basic instructional materials with a strong emphasis on a high level of interactivity. The introduction of online delivery has involved more than applying a new set of teaching tools; it has also involved an emerging appreciation that a new mode of learning was also involved. Teachers have found that the clarity required in delivering online has forced them to hone their skills in producing a clear, concise training program. It has highlighted the role of a teacher as a facilitator/learning guide manager.

From the Hotel School's experience in this new delivery mode, the keys to successful online delivery are said to be giving effective instructions, accessible references, ease of access to the system and competent facilitation by the lecturer. The Hotel School is currently exploring the 'e-moderating' model of online delivery, a model developed by Dr. Gilly Salmon, Open University, UK. Part of the institute's strategic plan is focussed on professional development, which will incorporate the 'e-moderator' model of delivery.

The model identifies five steps for introducing students to an online environment. The model encourages the moderator to play less of a role in initiating and directing the communications flow by not responding to every individual inquiry. The focus is on encouraging the group to communicate with each other with the role of the moderator being more to respond to the theme of the discussion rather than to respond to students individually. This approach shifts the role of a lecturer from being a teacher upfront to a facilitator from the side and reinforces the principles of self-directed learning for students.

> The main shift is changing from being a teacher to being a manager of learning. This is a big change for most people because we all have a mental model for how to learn. The new approach is based on encouraging teachers to prepare material that is self-directed and will prompt students to learn rather than be taught. The role of a teacher is to manage the learning process. This is quite a change in approach for some teachers and will be the biggest challenge in professional development for the successful management of online delivery.
>
> *(Education Manager, Flexible Delivery Unit, Regency Hotel School)*

The case study found that the cost of course development, set-up costs and delivery costs have been largely absorbed within the existing funding allocations of the institute. The allocation of funds and staff time for the development of materials was the most significant one-off expense. Delivery costs appear to be equivalent, if not slightly less than face-to-face delivery methods. However, this comparison does not reflect the extra funding needed for professional development

However, as a result of the upfront work, future significant cost savings will come from ease of revision compared with a traditional paper-based course. The costs and time involved in designing, editing, printing and modifying paper-based resources have been found to be three to four times greater than for developing online courses. The greater ease in developing new courses for an online environment makes it more cost-efficient to provide a greater range of courses to students.

The increased flexibility provided by online delivery means that this mode of delivery is more time-efficient and hence cost-efficient. In contrast, paper-based delivery is expensive to modify and is also less reliable in terms of ensuring that students are made aware of any changes. Online delivery ensures that students have access to the most up-to-date information about the course and access to reference material the instant it is posted online.

The overall effectiveness of offering a course entirely online needs to be judged over the long-term as it appears to be a valuable means for motivated students to keep learning under conditions most convenient for them. This case study has demonstrated that a highly flexible model of learning, although initially expensive to set up, can command high fees if it is delivering vocational skills that are well remunerated and in demand and suits students' working and family commitments.

However, the future prospects for the course are likely to depend on its reputation among former and current students. This, in turn, is likely to depend on student satisfaction ratings, not able to be reported on in this case study. The challenge is to work out cost-effective ways to best support a student-centred learning process. The issue for the future is to use online delivery as one among a range of techniques to support students in their quest to manage their own learning.

OTEN-Distance Education's Certificate Level 4 in Information Technology (PC Support)

Bruce Thomson

Overview

The focus of this case study is a course that has been delivered entirely online in distance learning mode for four years. Unlike several of the other case studies which have mostly involved mixed-delivery modes, this case study looks the application of online technologies within a traditional distance education framework. Scrutiny of the Certificate Level IV in Information Technology (PC Support) delivered by the NSW TAFE's Distance Education Institute (OTEN-DE) offers the opportunity to assess the cost-effectiveness of online delivery compared with other forms of distance education.

The point of comparison for the course under study, therefore, is with courses conducted in the classic correspondence-school model of paper-based post-delivered instruction. In the latter, students progress through the course at their own speed, usually in isolation. However, it should also be noted that distance education, even in its classic forms, could also include synchronous communication through media such as short wave radio and, more recently, telephone conference calls. By contrast, online delivery offers the opportunity for low-cost synchronous and asynchronous communication.

Two features of the case study are worth noting. In terms of assessing costs, the case study is able to draw on the published detailed assessments of costs carried out by the course convenors (see Webb & Cilesio 1999a, 1999b; Webb & Gibson 2000; Webb 2000). The thoroughness of this work, gained from first hand knowledge of running the course over four years, makes this information particularly valuable.

The different student profile in terms of interest in and background knowledge of computers compared with the other case studies is also important to note. As the purpose of the course is to impart the knowledge needed by those providing a computer help desk function in a medium-to-large organisation, students self-select in terms of their interest in and familiarity with computers. In the other case studies, most students have been less familiar with computers and the use of the internet. However, it is not clear, *a priori*, what effect greater student familiarity with the technology might have on their overall perceptions of the effectiveness of online delivery.

In terms of effectiveness, both instructors and students generally offer positive feedback. The instructors enjoy the challenges and variety provided by a different mode of delivery, while students value the additional flexibility it provides when compared with other modes of delivery. However, despite the course's effectiveness, it represents a relatively high-cost model of delivery. The case study reveals the difficulty of achieving these outcomes in a cost-effective manner, given particular factors applying in the OTEN-DE environment.

This case study demonstrates how the cost-effectiveness of online delivery depends on the wider institutional setting in which the course operates. Resource constraints due to the application of an institute-wide funding formula limits the funding available for online delivery. The result is an emphasis on cost-efficiency rather than cost-effectiveness.

The funding formula needs to take into account learning effectiveness. In other words, if online is more expensive to deliver compared with more traditional distance education courses, this extra cost needs to judged against whether this mode of delivery achieves better outcomes such as higher completion rates or higher levels of student satisfaction compared with the traditional distance education delivery mode.

Organisational context

Distance education and training has a long history in NSW. Vocational education and training courses were first delivered by correspondence in NSW in 1910. Since that time, there have been many changes in the supporting organisational arrangements for distance delivery. The Open Training and Education Network was established in 1992, replacing the former Open College Network of TAFE. In 1993, the distance education facilities of the then Department of School Education and the NSW TAFE Commission were amalgamated to form what is now OTEN-DE as a separate institute of TAFE. There are now over 800 on and offsite teaching staff involved in the delivery of courses and development of resources.

OTEN-DE is the largest provider of distance education and training in Australia. It is a registered training organisation and is currently working towards becoming a quality endorsed training organisation (QETO). The major component of its delivery program is the Open Learning Program, which offers some 250 TAFE NSW courses (comprising over 600 subjects and modules) to over 32 000 students from across NSW, elsewhere in Australia and overseas. In addition, OTEN-DE provides distance education and flexible delivery to schools and commercial clients.

All courses which OTEN-DE delivers are Statewide courses developed by Educational Services Divisions of NSW TAFE. This means, therefore, that the Certificate Level IV in Information Technology (PC Support), the subject of this case study, is also available by face-to-face delivery through TAFE institutes around NSW. However, the focus of OTEN-DE is on more flexible forms of delivery to reach 'those students whose learning objectives are restricted by distance, disability isolation or other life circumstances'. OTEN-DE aims to provide educational experiences that are delivered flexibly, using appropriate traditional and technological means.

There are over 3000 students enrolled in IT courses delivered by OTEN under the Open Learning Program. Established distance delivery arrangements are used for the majority of these courses. OTEN uses a range of delivery methods, including print, fax, email, telephone, video tapes, satellite broadcasts, CD-ROMs, audio cassettes and face-to-face workshops. OTEN's distance education courses use mainly printed lesson materials, with teachers providing support by telephone or email. Other support options include tutorials and seminars through videoconferencing. Some subjects offer home study combined with workshops.[7]

The common feature however, is that students set their own schedules, choose the order in which they study their modules and instructors provide support in a reactive way when contacted by the student. This delivery is highly efficient, costs being claimed to be half those of face-to-face delivery (Webb & Gibson 2000). However, the delivery mode's reliance on a high level of motivation from the student who has to work in isolation from face-to-face contact with other students and the instructor often means that completion rates are lower than for courses based on face-to-face teaching and classroom interaction.

The Certificate Level IV in Information Technology (PC Support) is the only course conducted by OTEN that differs both in terms of costs and outcomes. The course was both initially more expensive to set up than other distance education modes and is more expensive to deliver on a recurrent basis. However, counterbalancing this is a higher completion rate, which is on a par with courses delivered face-to-face.

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[7] See the OTEN website http://www.oten.edu.au/oten/frames.cfm?page=studying%2Fstudying%2Ehtm [accessed: 23 April 2001]

Nature of the course

The course was developed on the initiative of an instructor, Ms Julie Gibson, who had an early appreciation of the potential of the internet as a training delivery method. Work commenced on the course in mid-1996 with the construction of the website. A single module was trialled in late 1996 to test the methodology and user acceptance of the delivery method. The trial involved 23 students, recruited from the existing certificate level III program and elsewhere. An evaluation of the trial found that students enjoyed the ability to communicate quickly and easily with instructors, both for learning the content and for resolving administrative issues. Communication with other students was also considered a major advantage over forms of distance delivery. The course convenors have aimed to keep these features in the system as it has developed.

Development of the course and the delivery platform were funded by a grant through an ANTA program for the development of flexible learning materials. The first students were enrolled in March 1997, graduating in August 1998. The course has undergone some changes, primarily in terms of the teaching strategies employed and the degree of online delivery used. The istructors now take a pro-active role in guiding students through the program to ensure that timeframes are met. This differs substantially from the established OTEN distance education methods where instructors employ a more reactive methodology.

The course has a nominal duration of 400 hours and consists of 13 modules and is delivered almost entirely online. The proportion of time spent on face-to-face practical workshops has been reduced from 8% in 1999 to 5% in 2000, as online resources have been developed to replace practical workshops. Its objectives are to impart a range of skills and supporting knowledge in the understanding of microcomputer architecture and networking, installation of software and hardware, software and hardware selection, systems maintenance and the provision of advice and support to users. On completion, it is expected that the student would be able to find work as a PC Support officer or help desk operator in a medium to large sized organisation.

Student profile

OTEN-DE gathered detailed information on students undertaking the course in 1999 (Webb & Cilesio 1999b). The course was made up of equal numbers of males and females. Most were aged 30 to 40 years, employed full-time and living in metropolitan Sydney. The students gave a variety of reasons stated for choosing the course. These included the flexibility of not having to attend classes due to the constraints of full-time employment or distance from institutes. Other reasons given included the unavailability of the course at the local institute and disabilities preventing attendance at an institute.

The majority of students are graduates of the certificate level III in Information Technology, delivered by OTEN-DE and TAFE institutes. The admission requirements for this course are completion of the Certificate Level III in Information Technology or equivalent. RPL is available but the complexity of accurately assessing equivalence means that those who have completed the Certificate Level III take most places in the course.

The basic format of the course is described in Webb and Cilesio (1999b). The modules are offered at scheduled times. The objective of this is to ensure that students who complete all modules on time will also be able to complete the course in the scheduled 12 months. It also allows for the appropriate scheduling of practical workshops.

Students can download and print resources, use a downloaded version offline or study online. Instructors support students in a proactive way by assisting them in the setting of weekly goals, motivating the group and individuals, providing additional material to enhance learning tasks and general administrative matters, such as technical assistance. Students are encouraged to stick to the study timetable but can work at their own pace and complete the module earlier or later than the scheduled time. However, there is no guaranteed support from the instructor outside the timetabled period. Students can also work ahead of the timetable but there is also no guaranteed instructor support.

Each week begins with students making contact by registering a weekly roll call message. This employs an internet survey program that sends a message to students to which they reply. Instructors are required to check emails at least once per day on weekdays and respond within 24 hours. Although instructors are not required to work in evenings or on weekends, instructors in fact tend to work the hours that suit them, often teaching online in the evenings and at weekends.

A number of other communication tools are used to support the teaching and learning process. 'Annotations', is a system developed by OTEN which permits students to interact with instructors and other students by adding comments to a page. This is considered by the convenor to be most effective when used in conjunction with learning materials where a student posts a question to a page, the instructor responds and other students witness the responses. It also provides a mechanism by which instructors can add and update their pages on the site. In addition to Annotations, the course incorporates email, and text-based synchronous and asynchronous conferencing to enable communication between instructors and students and the submission of assessment tasks.

Assignments are available on the website and can be opened and printed at any time. Tests are also accessed online but are generated only when the student has met stipulated requirements. The test must be completed within a specified time in the presence of an approved supervisor, who signs a slip to confirm this. The student submits the assignment or test to an email address that notes the time of receipt, which allows the supervisor to verify that the deadline has been met.

The website does not link with student management/administrative systems. Consequently, a relatively complex manual reporting system is employed. Instructors keep records of assessment events and submit them to OTEN regularly for recording on the OTEN student management system (SAM). When the student completes the module, a final result is submitted to the TAFE student information system via a hand-completed mark sheet.

Application to enrol in the course can only be made online. The data collected are not integrated with official TAFE enrolment information. This is identified by the convenor as a significant inefficiency. Students enrol in February for the year. Students enrolled at other institutes but needing to pick up a subject not available at their institute can enrol mid-year if places are available. It is possible for students to work ahead and finish early but the convenor notes that the complexity of the program makes it difficult to complete in less than one year without significant recognition of prior learning. Students who do not complete within the year and wish to continue are required to re-enrol which involves an extra cost to them.

Costs

Establishment costs

OTEN received a grant of $350 000 from ANTA to establish the course. Table 23 presents OTEN's estimates of the costs of establishing the course.

As indicated below, the major components of establishment costs arose from the development of resources and the website, and purchase and set-up of a new system to service the course. Additional costs were the training of instructors in the use of the new technology, but these costs are estimated by OTEN to be not significant. All these costs were incurred solely in relation to online delivery.

Table 23: Estimated costs associated with the establishment of the Certificate Level IV in Information Technology (PC Support)

Item	Cost	Comment
Learning resource development	$200 000	Learning resources were developed by OTEN resource development staff. The actual cost of resource development was higher and was borne by OTEN through its ongoing salaries budget.
Project management/website development	$100 000	Work related to these tasks was also undertaken by OTEN staff and not costed separately.
Purchase and set-up of system	$20 000	OTEN purchased an 'off-the-shelf' system, which required some modification.

Recurring costs

Webb and Cilesio (1999b) have collected data on the costs involved in the delivery of the course. After identifying the primary cost components, experienced instructors were asked to estimate the level of these components, given a class of 50 students, a 100% retention rate and all students completing the course within one year. The analysis did not include establishment costs. This method was chosen because of concerns that the 'experimental' nature of the delivery system meant that actual current costs were then unrealistically high, and would not provide an accurate picture of its potential.

Webb and Cilesio (1999), using the method described above, estimate that the real wage costs of instructors are twice those associated with traditional distance education delivery. The high level of instructor/student interaction is a major source of this additional cost. Instructors also spend considerable time involved with administrative tasks associated with the processing of applications and assessment tasks. It should be noted that the cost increase for wages has not actually been incurred. This figure reflects the estimation of instructors that they would spend twice as much time in the teaching of an online course as for traditional distance delivery. Assuming that this is accurate and that they are not paid for work undertaken as overtime, the instructors are effectively bearing the additional cost themselves.

Table 24 presents estimates of the additional recurrent costs of online delivery by comparison to those of traditional distance delivery for a similar course, as identified by the course co-ordinator. Additional labour costs arise from the updating of web pages, maintenance of technology and technical support of instructors and students. These costs represent new costs incurred solely because of online delivery, therefore, no comparative data with other delivery modes are available.

Table 24: Estimated additional recurrent costs associated with the delivery of the Certificate Level IV in Information Technology (PC Support), by %

Additional recurrent costs	%
Wages of teaching staff	100
Training teaching staff	20
Training administrative staff	50
Training management	50
Training web writers	20

While the content of the course has not changed significantly through its life, there are additional costs associated with the constant need for updating resources and enhancing the web page. Maintenance of technology, particularly support of the server hardware, operating system and the Virtual Campus are ongoing requirements that involve additional expenditure. Technical support is provided to instructors (and students) by the course convenor, the technical support officer for the Virtual Campus server or the IT Teaching Section help desk. Instructors who are new to the course are also given a two-hour one-on-one induction to the course. Students, on the other hand, attend a compulsory orientation day at the beginning of the course where they are instructed in the use of the Virtual Campus, how to submit assessments, and participate in forums and chat groups related to their course. All of these support functions are an additional cost over and above other forms of delivery.

Students also incur additional costs in undertaking the course. From the survey of students administered as part of this case study, information was sought on the costs they incurred in undertaking the course. In response to a question on hardware and software costs incurred due to online delivery, 54% of respondents stated that they spent at least $200 on hardware and 39% spent at least $100 on software. The significant time required to download and print learning materials from the website also entails significant costs to students.

Effectiveness

The effectiveness of online delivery of the Certificate Level IV in Information Technology (PC Support) can be assessed in several ways. Reported below are the output and outcome measures related to the proportion of students completing different aspects of the course. Information about perceived effectiveness from the students themselves is also discussed. This information is derived from an in-house evaluation survey and a special survey conducted for this case study.

Tables 25, 26 and 27 provide information derived from administrative records about three types of output and outcome measures (Webb & Gibson 2000). The working rates for the course for the years 1998 and 1999 are shown in table 25. Table 26 provides information on module completion rates for the years 1997 to 2000. Table 27 outlines the course completion rates for the same four years.

Table 25: Working rates 1998–1999, OTEN Certificate Level IV Information Technology (PC Support)

Year	Working rates (%)
1998	88
1999	89
2000	n/a

Table 26: Module completion rates 1997–2000, OTEN Certificate Level IV Information Technology (PC Support)

Year	Module enrolments	Modules completed	Module completion rate (%)
1997	164	65	40
1998	472	292	62
1999	660	472	72
2000	409	20[illegible]	50

Table 27: Course completion rates 1997–2000, OTEN Certificate Level IV Information Technology (PC Support)

Year	Enrolments (n)	Course completion rate (%)
1997	23	26
1998	50	30
1999	64	53
2000	56	20

Webb and Gibson (2000) note that the working rate is considerably higher than for courses utilising traditional distance education delivery modes. They also note that the module and course completion rates for the OTEN IT (PC Support) course to 1999 have improved markedly over time to a point where they are now equivalent to the 'lower end' of face-to-face delivery courses and superior to those of traditional distance education delivery modes.

However, the notably lower module and course completion rates in 2000 are a departure from the trend upwards between 1997 and 1999. Staff shortages in 2000 forced a reduction in the level of contact between teachers and students compared with previous years. In 2000, teachers were not associated with specific modules. In addition, there was a decrease in assistance from the help desk and newsletters are no longer issued. This lower level of interaction appears to have had a marked effect on these outcomes measures.

The difference between the completion rates for modules and the course as a whole also needs some explanation. The reasons for module completers not continuing on to complete the course mostly relate to factors external to the course. The NCVER student outcomes survey 2000 notes that employment-related and personal reasons account for 76% of the main reasons given by module completers for not continuing to study (NCVER 2001, p.12). The course convenor believes that the majority of withdrawals from the course are due to work-related or personal reasons. He notes that a number of students undertake the course with specific purposes in mind. This means that they are likely withdraw from the course once they have completed the appropriate module(s) or parts of modules relating to the knowledge and skills they were seeking.

Other possible reasons for withdrawal from the course include dissatisfaction with course content or with aspects of the course delivery. However, no evidence is available to support this. An internal evaluation based on a survey of students in 1999 showed a general liking for the online environment. The students surveyed identified the ability to receive fast responses to enquiries sent to instructors and the course manager responsiveness as strong features of the course compared with other forms of delivery.

Student satisfaction ratings

Students currently enrolled in the course or who have completed it were surveyed to seek their views on its effectiveness in terms of their learning outcomes. The survey was initially sent to participants in the 1999 course. When there were insufficient responses, the survey was sent to students of the year 2000 course. A total of 21 students out of the 66 students contacted responded to the survey.

Approximately two-thirds (67%) of the students had completed Year 12. In terms of age, 38% were aged 45 years or more, 19% aged 35 to 44 years, 38% aged 25 to 34 years and 5% 20 to 24 years. For 71% of the students, the course was their first experience of online delivery. The most frequently utilised forms of online activity undertaken were learning course content, assessment activities, one-to-one email with the instructor and, to a lesser extent, one-to-one email with other students. Only 19% of students participated in chat groups.

Students were asked to rate which aspects of online activity they found most valuable in 'helping you to learn'. The aspect that received the highest rating was 'assessment purposes', with 86% of students rating it as valuable or most valuable. Other aspects that received high ratings were 'learning course content' (71% rating it as valuable or most valuable) and one-to-one email with instructor (67%). The least valued aspects were chat groups (5%) and one-to-one email with other students (38%).

Students were asked to compare face-to-face delivery modes with online delivery used within the course. As many as 58% of respondents rated online contact as valuable or most valuable, compared to 43% for face-to-face contact. The face-to-face activities in this course only accounted for between 5% and 8% of the total course time. However, it did provide a basis for comparison. This finding suggests that the course generated or at least maintained a high degree of support for online learning amongst the respondents. All respondents indicated a desire to undertake more courses or modules that are delivered online.

Students were asked to rate the effectiveness of the course by indicating to what extent they agreed or disagreed with a series of statements. Although most (86%) agreed or strongly agreed that they knew how to use a computer and the internet before starting the course, significant proportions of students said that the course had enabled them to improve their computer and internet skills. As many as 62% agreed or strongly agreed that the course had increased their computer skills, 48% agreed or strongly agreed that their internet skills had improved and 43% that their ability to use email had improved. In such a group, these results seem impressively high.

Students were asked a series of questions regarding communication with instructors and other students. The feedback on these aspects of course effectiveness is somewhat mixed. While 72% of respondents agreed or strongly agreed that they are confident in communicating with the instructor, only 48% agreed or strongly agreed that communication with the instructor was an easy process. Only about one-third of respondents agreed or strongly agreed that online delivery improved access to the instructor or instructor.

As noted above, the course convenor had indicated that staff shortages in 2000 forced a reduction in the level of contact between teachers and students compared to previous years. He suggests that this is likely to have been a key factor contributing to the relatively low levels of satisfaction with these aspects of the course. These staff reductions have altered the 'pro-active' teaching approach of previous years.

Communication with other students received a low rating. While 62% agreed or strongly agreed that they were confident in communicating with other students, only a third agreed or strongly agreed that communicating with other students is an easy process. An even lower proportion (24%) agreed or strongly agreed that online delivery helped link the student with others outside the classroom. These responses raise the question whether the potential for better communication between instructors and students provided by the technology and course pedagogy could be better utilised.

The convenor comments that the circumstances of the students involved in the course (full-time jobs, family commitments etc.) often militate against high levels of contact with other students. His experiments with asynchronous forums indicated that few students are interested in participating. Unlike full-time students, part-time students have less expectation of student-to-student socialising/communication. He believes that group work must be made compulsory in order for part-time students to participate.

Almost two-thirds of respondents (62%) agreed or strongly agreed that they always completed their assessment tasks on time. However, responses to questions on skills developed through the course were less positive. Only one-third agreed or strongly agreed that their written expression and explanation of concepts in writing had improved during the course. This might reflect the fact that most students had already developed such skills in other courses undertaken prior to this or that the course gave them no incentive or opportunity to improve these skills. Alternatively, students may not actually perceive such skills as particularly important in such a course.

The course also receives positive feedback in terms of flexibility. Almost all (81%) strongly agreed that they were able to learn when it suited them. Almost three-quarters agreed or strongly agreed that the course allowed them to complete work when then they want. In response to the statement 'flexibility in the time spent working on the course helped me to learn better', 80% agreed or strongly agreed.

However, responses to the survey suggest that there may still be a preference for face-to-face, or traditional delivery, if available and feasible. Only 43% of respondents agreed or strongly agreed that online delivery 'helps the student to gain a better understanding of course material' and 'learn more relevant information' than if it were delivered face-to-face. The convenor has commented that it is likely that students would not select distance delivery as a preference but accept it because they no alternative. However, online delivery was of help in the learning process as 58% of respondents agreed or strongly agreed that the technology increased their motivation to work, and 76% agreed or strongly agreed that the course was easier to complete because it was delivered online.

Students were also asked to rate aspects of their training using items from the NCVER student outcomes survey. Students were asked to rate the nominated aspects of training using a ten-point scale. Table 28 compares the ratings given by OTEN IT students (n = 21) with the ratings given by students nationally who completed their course during 1999 and graduated with a qualification from a course (n = 41 600).

Table 28: Comparison of student rating of OTEN IT course with overall national rating of VET training by 1999 TAFE graduates, rating out of 10

Aspect of training	OTEN IT (PC support) course	National
Instructors' knowledge of subject content	7.4	8.2
The balance between instruction and practice	6.6	7.5
Making methods of assessment clear	7.0	7.7
The subject content reflects industry practice	6.5	7.6
The presentation of training material	7.1	7.5
The quality of the equipment provided for you to practise your skills	6.8	7.3
Having enough equipment for you to practise your skills	7.3	7.2
Access to learning resources	7.4	7.8
The convenience of both venue and class times	6.5	7.7
The usefulness of the training for your job prospects	7.8	7.7
The overall quality of the training you have received	7.5	7.9

Note: Not applicable, don't know and no response have been excluded.

Source: NCVER (2001)

A comparison of satisfaction ratings for each of the specific training aspects in table 28 shows that in many cases the OTEN IT (PC Support) course does not score as highly as the national average. The results suggest that the OTEN IT (PC Support) course using online delivery methods scores lower satisfaction ratings than for those given by graduates of all TAFE courses. However, the comparison is not a fair one. A more accurate comparison is to assess the course's satisfaction ratings against other online and correspondence-based courses. However, as noted above, the national survey only records information on less than 10% of distance education-based courses. Taking into consideration the higher satisfaction levels that face-to-face courses are likely to get, the results reported in table 28 for the OTEN IT (PC Support) course actually reflect well on the course.

The aspects of training where lower satisfaction levels exist for the OTEN IT (PC Support) course compared with all TAFE courses are: the convenience of both venue and class times, the subject content reflects industry practice, and the balance between instruction and practice. The lower satisfaction ratings for class times suggests that the set class times required by the course are not regarded favourably by the students. However, the course convenor believes that, nonetheless, the strategy does help completion rates and notes that many students have thanked OTEN on completion of the course when 'they realise they would not have completed the course without timetabling'. He suggests that timetabling can be dispensed with in shorter online courses but is essential in longer courses where there is an expectation of completing.

The lower satisfaction rating for the subject content reflecting industry practice suggests that the course may be now somewhat dated in its content. This is also confirmed by the lower satisfaction rating for the instructor's knowledge of subject content. A new course is to replace this course in 2001 based on the new IT training package. The course was first accredited in 1996, which means that it could have been initially developed as long ago as 1995.

The third aspect of the OTEN IT (PC Support) course that receives a lower satisfaction rating is the balance between instruction and practice. This suggests that online features of the course need to be more interactive to provide more practice. In 1996 when the program was first conceived, building in ways to communicate was seen as high priority and effort was put into communication systems (for example, Annotations) rather than interactive assessments and exercises. The course was based on a print-based delivery model. The revised course will be able to take advantage of the availability of more interactive communications tools today.

The key outcome indicator used by NCVER is graduates' satisfaction with the overall quality of the course in which they qualified. In 1999, 67% of TAFE graduates nationally rated their course in terms of overall quality of the training received as eight or above (defined by NCVER as satisfied). However, only 57% of OTEN IT (PC Support) course graduates and current students from the online delivery course rated the overall training quality of their course as eight or above. Only a quarter (24%) of the OTEN IT (PC Support) course respondents (24%) awarded it the highest score of ten or excellent.

The course convenor believes that these results are good for a distance education course. He is confident that, if the survey related to distance only programs, the OTEN IT (PC Support) course would compare most favourably. The claimed lower satisfaction levels associated with distance education courses could be due to several factors. These include the lack of appropriate resources to compensate for the difficulties experienced by learners with this form of delivery. The second and related aspect that could explain lower satisfaction levels with distance education is the heavy reliance placed on self-managed learning. The supports of classroom interaction with instructor and fellow students are missing and the onus is placed on the individual to maintain his or her motivation to continue participation in the course.

Conclusion

Online delivery has produced a number of benefits for OTEN. The course has provided excellent publicity for and recognition of OTEN. As an example of this, a graduate of the course received a TAFE NSW medal for the course. It also represents a major extension of the scope of OTEN-DE in that it has introduced online delivery as an important tool for the organisation. The ability of instructors to publish learning resources and advice without the need to go through the lengthy processes required in other delivery environments is also seen as a major benefit. Involvement in the course has also reinvigorated participating instructors by providing them with the opportunity to develop new skills.

However, several disadvantages of online delivery can also be identified for the organisation, instructors and students (Webb & Cilesio 1999b). The main disadvantage for the organisation at present is the lack of appropriate funding mechanisms to cover the full costs of delivery. The current funding formula for OTEN makes no distinction between online delivery and traditional distance delivery. Accordingly, face-to-face TAFE institutes are funded at twice the rate of OTEN if they choose to deliver the course online.

Other disadvantages of online delivery identified by instructors include the pressure to respond quickly to students, the inability to gauge how much time is required and the need to interface with existing infrastructures/systems that requires duplication of effort, especially in relation to the processing of assessments. The first factor is clearly critical to ensuring the effectiveness of this delivery mode. Experience with online delivery will also presumably enable instructors to better estimate time required and to plan their activities accordingly. The streamlining of other work processes such as assessment can also greatly assist in this regard.

Several factors may be impeding the achievement of more cost-effective outcomes for online delivery. The impetus for this course, in common with many other courses like it, has come from enthusiastic, committed and highly skilled individuals, rather than as an initiative directed by senior management. This has a number of negative impacts associated with a lack of integration with administrative systems. The existing platform does not have open-ended interface with these systems, resulting in instructors being required to undertake time-consuming administrative tasks.

Integration with administrative systems would enable major efficiencies to be achieved in the processing of applications and assessments for both administrative staff and instructors, who would then be able to focus on their core responsibilities.

Experience with this course reinforces the fact that the introduction of online delivery raises issues that need to be dealt with on a wider organisational scale. Development of a reliable system to authenticate that the student's work submitted for assessment task is one way that the work process could be further changed to introduce more cost efficiency without necessarily affecting effectiveness.

Development of industrial arrangements that reflect the realities of the online environment would make it easier to realise the full potential flexibility of the delivery method. There is currently no framework to determine how instructors can be paid to teach online courses. At present, instructors themselves bear much of the additional costs associated with it. Further cost-efficiencies could be secured through the greater involvement of non-teaching staff in performing certain roles such as monitoring emails and website maintenance. At present, there is no industrial classification in NSW TAFE award for a teacher's assistant or technical support person.

The pedagogy utilised in the entirely online OTEN IT (PC Support) course, together with instructors undertaking relatively intense monitoring of students, has succeeded in delivering more effective outcomes. However, this improvement has not fully offset the increased costs, which have been assessed by OTEN-DE as approximately double those of traditional distance delivery. This means that the OTEN IT (PC Support) course is not more cost-effective than traditional distance delivery modes. However, given the rate of improvement up to 1999, it is possible that its relative cost-effectiveness will improve.

Nevertheless, certain barriers remain. While the project-based approach to the development and delivery of the course has provided certain efficiency advantages through the ability to circumvent normal bureaucratic processes, the delivery mode suffers due to a lack of integration with administrative systems. This results in instructors being involved in time consuming administrative tasks that could be streamlined if integrated into the online delivery platform. Moreover, current industrial arrangements act against a more efficient use of human resources.

However, experience with this course has been instrumental in OTEN-DE developing a strategy for a more cost-effective utilisation of online technology. This strategy will see print-based resources being supported with online information and communication. This strategy, however, is only likely to deliver its promise if it is flexible enough to allow for online delivery to be used in a variety of ways, with cost-effectiveness being a key factor in determining its exact role. Online distance education has a strong appeal to motivated individuals who are time-constrained, provided they can participate in a responsive and interactive form of distance delivery.

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